



行政院所屬各機關因公出國人員出國報告書

(出國類別： 研 習 )

環境音量監測實務及操作系統研習

To study the environmental noise monitoring affairs  
and the operation system

服務機關：行政院環境保護署  
出國人職稱：環境技術師  
姓名：林怡君

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行政院環境保護署

聯絡人/電話:

李秋燕/23117722#2721

出國人員:

林怡君 行政院環境保護署 空保處 環境技術師

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內容摘要: 由於近年來工商業發達，人口密集，人與人之間之距離愈來愈近，相對造成嚴重噪音污染問題，影響民眾生活環境安寧；為了解美國各級政府對噪音管制之方式，及了解美國是否與我國相同，亦有噪音監測站之設立等事項，特至美國加州奧克蘭、華盛頓特區、馬里蘭州巴爾的摩市、紐約市等美國東、西岸大都會區，實際拜會包括美國舊金山灣區政府協會 (ABAG)、加州運輸部 (Caltran)、奧克蘭市社區經濟發展局 (COCE)、美國環保署 (USEPA)、馬里蘭州政府環境部 (MDE)、馬里蘭州運輸部 (SHA)、哥倫比亞區污水處理廠 (DCWASA)、駐紐約台北經濟文化辦事處、紐澤西州立大學 (Rutgers) 及紐約市環保局 (DEP) 等單位。本次研習活動參訪對象包括美國聯邦政府、州政府及市政府等各層級之美國政府官員，並拜訪紐澤西州立大學之噪音專家；研習內容包括：加州環境噪音污染管制方式研習、加州運輸交通噪音管制事務研習、加州奧克蘭市噪音管制處理實務研習、美國政府噪音污染管制政策及環境音量監測實務及操作系統研習、馬里蘭州政府噪音污染管制機制研習、馬里蘭州政府高速公路噪音污染管制機制研習、哥倫比亞區污水處理廠噪音監測實務及操作系統研習、參訪駐紐約台北經濟文化辦事處，了解紐約相關機構噪音管制方式、環境音量監測實務研習及研習紐約市噪音管制實務。雖然本次研習計畫全部行程僅為期十五天，然十個工作天在美國環保署楊仁泰博士、美國舊金山灣區政府協會楊欽明博士及美國能源部李正民博士妥適安排下，雖然短暫，卻相當充實。因為美國噪音污染問題不像我國一樣嚴重，相關主管噪音事務之機構及單位皆頗不易尋獲，對於上述各位博士之大力協助與安排，本人深表感激之意。此次研習提昇了本人專業知識，並增進對美國各層面噪音管制業務之了解，對於本署未來擬進行環境音量標準及相關噪音管制業務之推動有相當大之助益。

本文電子檔已上傳至出國報告資訊網

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# 環境音量監測實務及操作系統研習

行政院環境保護署 林怡君

中華民國九十二年十一月十三日

## 摘 要

由於近年來工商業發達，人口密集，人與人之間之距離愈來愈近，相對造成嚴重噪音污染問題，影響民眾生活環境安寧；為了解美國各級政府對噪音管制之方式，及了解美國是否與我國相同，亦有噪音監測站之設立等事項，特至美國加州奧克蘭、華盛頓特區、馬里蘭州巴爾的摩市、紐約市等美國東、西岸大都會區，實際拜會包括美國舊金山灣區政府協會(ABAG)、加州運輸部(Caltran)、奧克蘭市社區經濟發展局(COCE)、美國環保署(USEPA)、馬里蘭州政府環境部(MDE)、馬里蘭州運輸部(SHA)、哥倫比亞區污水處理廠(DCWASA)、駐紐約台北經濟文化辦事處、紐澤西州立大學(Rutgers)及紐約市環保局(DEP)等單位。

本次研習活動參訪對象包括美國聯邦政府、州政府及市政府等各層級之美國政府官員，並拜訪紐澤西州立大學之噪音專家；研習內容包括：加州環境噪音污染管制方式研習、加州運輸交通噪音管制事務研習、加州奧克蘭市噪音管制處理實務研習、美國政府噪音污染管制政策及環境音量監測實務及操作系統研習、馬里蘭州政府噪音污染管制機制研習、馬里蘭州政府高速公路噪音污染管制機制研習、哥倫比亞區污水處理廠噪音監測實務及操作系統研習、參訪駐紐約台北經濟文化辦事處，了解紐約相關機構噪音管制方式、環境音量監測實務研習及研習紐約市噪音管制實務。

雖然本次研習計畫全部行程僅為期十五天，然十個工作天在美國環保署楊仁泰博士、美國舊金山灣區政府協會楊欽明博士及美國

美國能源部李正民博士妥適安排下，雖然短暫，卻相當充實。因為美國噪音污染問題不像我國一樣嚴重，相關主管噪音事務之機構及單位皆頗不易尋獲，對於上述各位博士之大力協助與安排，本人深表感激之意。

此次研習提昇了本人專業知識，並增進對美國各層面噪音管制業務之了解，對於本署未來擬進行環境音量標準及相關噪音管制業務之推動有相當大之助益。

## 壹、前言

依據美國環保署 1972 年於噪音法中對噪音之定義為：噪音為「不想要之聲音或於不適當時間不適當地點發出之聲音」；依據美國勞工部職業安全衛生署(OSHA)則將噪音定義為「足以傷害聽力的聲音」；噪音亦同時被定義為「不渴望或討厭之任何聲音」，因噪音會干擾談話、溝通過程與影響民眾之聽力，所以我國亦於民國七十二年制定噪音管制法管制噪音。依據我國噪音管制法第二條之規定，「本法所稱噪音，係指超過管制標準之聲音」，而依據噪音管制法第七條第二項所訂定之噪音管制標準，則包括：(一)工廠(場)(二)娛樂、營業場所(三)營建工程(四)擴音設施等噪音管制標準。本署並依據噪音管制法之相關規定，制定包括(一)機動車輛噪音管制辦法(二)軍事機關及其所屬單位之場所工程及機動車輛航空器等裝備噪音管制辦法(三)機場周圍地區航空噪音管制辦法(四)民用航空器噪音管制辦法(五)環境音量標準等相關子法，以針對包括娛樂及營業場所噪音、擴音設施、工業、道路車輛、鐵路、航空器、營建工程與近鄰噪音等進行管制。

環境噪音問題於世界各國皆日益嚴重。在美國有超過百分之四十之人口曝露在超過 55 dB(A)的交通噪音中，在歐盟與日本，曝露百分比更高。相對於其他環境問題，噪音污染問題持續增加，同時伴隨著噪音陳情案件益逐年增加。以台灣地區為例，噪音陳

情案件，於民國七十七年約為七、八〇〇件，而後逐年升高，至八十九年達到約二七、〇〇〇件，至九十一年增加至約二八、五〇〇件。近三年之噪音陳情案件主要以娛樂場所噪音居首位、工廠噪音次之，兩者合計約佔噪音總陳情數百分之六十以上。

一般而言，聲音為從振動表面所產生之機械能，藉由物質週期性之壓縮與稀疏分子而傳播。聲音可經由氣體、液體與固體傳播。

大多數噪音音壓以 A 加權位準最常使用，此係因人耳對各種音頻之反應並不一致，低頻率與高頻率較中間頻率效率低。為獲得一個單一值，以代表包含廣泛頻率範圍之聲音位準，且亦能代表人之反應，故必須將低頻率與高頻率針對中間頻率進行加權。合成之音壓位準為 A 加權，其單位為 dB (A)。

為維護達成維護民眾居家環境安寧之目的，特希望能藉由此次出國研習之機會，吸取美國相關機構及專家之經驗，俾便有效推動我國噪音管制業務。

## 貳、參訪目的

本次出國研習係奉行政院環保署選派參加中美基金九十二年度聯合技術協助訓練計畫，前往美國研習「環境音量監測實務及操作系統研習」，為期十五天。

台灣地區由於人煙稠密，人與人之間之距離相當密集，噪音早已是市民生活的一部份。我們在住家、學校或大街小巷總會受到各種噪音的影響，例如道路上的交通噪音、建築工程所發出的營建工程噪音和一般居住地點，因為嘈吵的冷氣系統、民眾喧嘩等產生之近鄰噪音、及娛樂及營業場所等所產生之噪音，都隨時存在，且無可避免。

本署為維護居家生活環境安寧，提高民眾生活環境品質，特於噪音管制法相關子法中，規定各地方環保局應將轄境內土地劃定噪音管制區，並依據噪音管制法施行細則第八條之規定，各環



保局應在各類噪音管制區內設置噪音監測站，以監測轄境內環境及交通噪音之實際音量，建立長期的環境噪音及交通噪音資料庫，以明瞭轄境內噪音分佈情況，並作為改善噪音及研擬未來噪音管制策略時之參考。

本署為衡量環境中之噪音品質狀況是否有所改善，本署在民國八十七年經行政院核定的「國家環境保護計畫」中，更訂定以全台灣地區「環境音量標準不合格時段數百分比」作為衡量噪音改善績效之指標，且設定近、中、長程噪音污染改善目標，針對民國九十年度的年度目標值為百分之二十，同時期望每年能降低一個百分點，進而達到民國九十五年的百分之十五。

近年來此指標值均介於百分之二十至三十之間，民國八十九年為百分之三九·七，九十年為三二·七，九十一年則為二四·六，離目標年值仍有數個百分比的差距。本署為瞭解目前美國此先進國家，針對噪音問題之管制方式，特選定美國各級政府進行參訪，以了解美國是否與我國相同，亦有噪音監測站之設立，且藉由參訪美國加州奧克蘭、華盛頓特區、馬里蘭州巴爾的摩市、紐約市等美國東、西岸大都會區，實際了解美國東、西岸不同政府機構，對噪音問題之管制方式。

## 參、赴美參訪行程

本次研習承蒙美國環保署楊仁泰博士 (Dr. Jentai Yang)、美國舊金山灣區政府協會楊欽明博士 (Dr. Chin Ming Yang) 及美國能源部李正民博士 (Dr. John Lee) 熱忱協助，並經行前以 e-mail 與電話聯繫討論後，確定了研習期間的行程。對於相關單位近二十位博士、噪音業務資深專家付出時間及精神，接待、傳授，並提供寶貴之經驗與資料，本人深感念，特誌謝忱。本次研習活動充實、緊湊、且實用，本人受益良多，相信對於往後業務之推動會有很大的幫助。

表一、赴美研習行程表

研習日期、時間 (Visiting Time)	研習地點 (Location)	實際研習機構及訪談對象 (Institutions & Persons to be visited)	研習目的及討論主題 (Topics for Discussion)
九十二年八月三日(日) 2003/8/3	台北至舊金山 Taipei— San Francisco	搭機赴美--行程	搭機赴美--行程
九十二年八月四日(一) 2003/8/4  10:30 A.M. --15:00 P.M.	加州奧克蘭 Oakland, CA	楊欽明博士, 美國舊金山灣區政府協會資深規劃師 Dr. Chin Ming Yang, Principal Association of Bay Area Government (ABAG)	加州環境噪音污染管制方式研習 The study of the environmental noise control in California
九十二年八月五日(二) 2003/8/5 10:00A.M. — 12:30P.M.	加州奧克蘭 Oakland, CA	克諾許塔博士 加州運輸部環境工程辦公室分局長 Dr. Glenn Kinoshita District Branch Chief State of California Department of Transportation, District 4 Office of Environmental Engineering	加州運輸交通噪音管制事務研習 To study the transportation noise control affairs of States of California
九十二年八月六日(三) 2003/8/6	加州奧克蘭 Oakland, CA	翁卡文, 奧克蘭市社區經濟發展局建築公共服務部	加州奧克蘭市噪音管制處理實務研習 To Study the Noise

14 : 00P. M. — 17 : 00P. M.		部長 Calvin N. Wong, P. E. Director of Building Services  City of Oakland Community & Economic Development Agency	control affairs of California Oakland City
九十二年八月 七日 (四) 2003/8/7	舊金山至 華盛頓特區 San Francisco To Washington DC	搭機-行程	搭機-行程
九十二年八月 八日 (五) 2003/8/8 10 : 00A. M. — 12 : 30P. M.       14 : 00P. M. — 16 : 30P. M.	華盛頓特區 Washington DC	楊仁泰博士, 資深 計畫經理 國際事務辦公室, 美國環保署 Dr. Jentai Yang, Senior Program Manger, Office of International Affairs (OIA 2650R)U. S. Environmental Protection Agency 費斯先生, 空氣及輻射辦公 室, 美國環保署 Kenneth E. Feith, Office of Air and Radiation U. S. Environmental	美國政府噪音污染管 制政策及環境音量監 測實務及操作系統研 習 U. S. Government policy concerning noise pollution control and the study of the environmental noise monitoring affairs and the operation system

		Protection Agency	
九十二年八月九日(六) 2003/8/9	華盛頓特區 Washington DC	收集資料及撰寫報告	收集資料及撰寫報告
九十二年八月十日(日) 2003/8/10	華盛頓特區 Washington DC	收集資料及撰寫報告	收集資料及撰寫報告
九十二年八月十一日(一) 2003/8/11 10:00A.M. — 12:20P.M.	馬里蘭州巴爾的摩市 Baltimore, Maryland	蔡史坦立博士, 部長, 馬里蘭州政府環境部 Dr. Stanley Tsai , Administrator, Maryland Department of the Environment, Environmental Permits Service Center 喬治哈曼先生, 計畫經理, 馬里蘭州政府環境部 George Harman, Program Manager, Maryland Department of the Environment, Environmental Assessment and Planning 結瑞克戴夫先生, 噪音稽查員, 馬里蘭州政府環境部 Dave Jarinko , Noise Control Inspector, Maryland Department of the	馬里蘭州政府噪音污染管制機制研習 Noise control mechanism of Maryland

		Environment	
九十二年八月十一日 (一) 2003/8/11 14:00P.M. — 16:30P.M.	馬里蘭州巴爾的摩市 Baltimore, Maryland	波卡克先生, 環境分析師, 馬里蘭州運輸部, 州立高速公路局 Kenneth D. Polcak , Environmental Analyst , State Highway Administraton , Maryland Department of Transportation	馬里蘭州政府高速公路噪音污染管制機制研習 Highway noise control mechanism of Maryland
九十二年八月十二日 (二) 2003/8/12 8:00P.M. — 9:00P.M.	華盛頓特區 Washington DC	張清奇博士, 計畫及設計部主管, 哥倫比亞區污水處理廠機械及技術部 Dr. Chein-Chi Chang, Planning and Design District of Columbia, Water and Sewer Authority ; Department of Engineering and Technical Services. 所輪史記華資, 公共衛生專家, 安全衛生部門, 哥倫比亞區污水處理廠 Sorin Schwartz, Industrial Hygienist, Department of Occupational	哥倫比亞區污水處理廠噪音監測實務及操作系統研習 The study of the environmental noise monitoring affairs and the operation system of District of Columbia Water and Sewer Authority

		Safety and Health, District of Columbia Water and Sewer Authority.	
九十二年八月十二日 (二) 2003/8/12	華盛頓特區至紐約 Washington DC to New York	搭機-行程	搭機-行程
九十二年八月十三日 (三) 2003/8/13 10:00A.M. — 12:30P.M.	紐約 New York	藍夏禮秘書 駐紐約台北經濟文化辦事處 Peter Lan, Senior Assistant to the Director General, Taipei Economic and Cultural Office in New York	參訪駐紐約台北經濟文化辦事處，了解紐約相關機構噪音管制方式 To visit Taipei Economic and Cultural Office in New York and study the noise control Mechanisms of New York
九十二年八月十四日 (四) 2003/8/14 10:00A.M. — 12:30P.M.	紐約紐澤西 New York New Jersey	日瓦林教授, 紐澤西州立大學, 環境噪音中心 Eric M. Zwierling, Director The State University of New Jersey Rutgers Department of Environmental Sciences	環境音量監測實務研習 To Study the Environmental noise monitoring affairs
九十二年八月十四日 (四) 2003/8/14 14:00P.M. — 16:00P.M.	紐約 New York	裘藍丁. 克羅平, 紐約市環保局局長 Geraldine Kelpin, Director, New York Department of Environmental	研習紐約市噪音管制實務 To Study the Environmental noise monitoring affairs of New York City

## 肆、參訪暨研習紀要

### 一、 加州環境噪音污染管制方式研習：

拜訪日期：九十二年八月四日

拜訪單位：美國舊金山灣區政府協會 Association of Bay Area Government (ABAG)

拜訪對象：資深規劃師楊欽明博士 (Dr. Chin Ming Yang, Principal Association of ABAG)

一般而言，於美國常用日夜音量(Day-Night Average Sound Level,DNL)，科學上之代號為 Ldn ，作為噪音之日夜平均聲音位準。Ldn，是由凌晨午夜至隔日午夜的二十四小時平均音量，單位為分貝，下午十時至翌日上午七時之音量各小時值均須加權十分貝。由許多研究顯示，人們在夜裡比其他時間更容易受到噪音之干擾。DNL 可利用移動式監測設備作定量量測。而由加州所發展「社區噪音均能音量」(Community noise equivalent level,簡稱 CNEL)CNEL 係，幾乎與 DNL 並無二致，唯獨對於下午七時至十時之時段考慮一中間加權值，有別於下午十時至翌日上午七時之權數。CNEL 亦同 DNL 可直接定量量測。大部分情況下，CNEL 之值近似 DNL 值。

### 二、加州運輸交通噪音管制事務研習：

拜訪日期：九十二年八月五日

拜訪單位：加州運輸部環境工程辦公室 (State of California Department of Transportation)

拜訪對象：克諾許塔博士分局長等人 (Dr. Glenn Kinoshita District Branch Chief, etc)

總體而言，於美國一般大眾常利用之交通運輸工具，包括：通勤火車(commuter rail)、街車或輕軌火車(street car/light

rail)、公車(motor bus)、電車(trolley bus)、捷運火車(rapid rail)，而發展大眾運輸之相關因素為：

- 都市規劃策略(strategies)
- 天然氣(natural gas)之價格
- 大眾運輸系統之設計
- 大眾運輸服務時之可靠性(一般民眾皆認為，準時之捷運服務比票價或車廂內之清潔還重要)

根據美國運輸研究委員會(Transportation Research Board)之「Making Transit Work: Insight from Western Europe, Canada, and the United States」報告，目前美國在城市間搭乘大眾捷運者僅有 2%；而西歐各國之大眾捷運搭乘率達 10%，加拿大之大眾捷運搭乘率亦達 4%；美國積極進行區域土地利用研究及運輸規劃，以試圖提升大眾運輸的搭乘率；但因美國各地方政府自行控制土地利用與規劃，很難將人口密集區域統合考慮及建立成功的大眾運輸系統。

依據克諾許塔博士分局長等人表示，於美國加州相關交通工程興建時，政府公部門常會邀集相關社區居民研商，並核撥經費，使居民於政府部門進行相關營建工程時，先行遷居於飯店中，使政府部門於密集工作時間內，將上述營建工程完成，如此不僅可以減少民眾於政府部門進行營建工程時，製造噪音或空氣污染等環境污染之抱怨，並可僅少工作時間，加速工程之進行。

此外，加州之鐵路客運長期改善計畫(California Passenger Rail System 20-Year Improvement Plan)將於 20 年內投資 101 億美元，新增加相關設施並更新既有路線，其目標為使鐵路客運更快速，車次更多且方便，預計都市之間之旅行與上下班通勤客量於 20 年內將可成長 300%，並可消除現有運輸擁塞情形。此鐵路改善工程包括：解除鐵路運輸瓶頸、更新號誌、增建新軌道、



部分路段提升至高鐵標準。改善計畫主要是針對四條鐵路客運廊道 (transportation corridors) 如下：

- (1) 太平洋沿岸廊道 (由聖地牙哥經洛杉磯到 San Luis Obispo, 共長 566 km)。
- (2) San Joaquin 廊道 (由 San Joaquin Valley 經 Fresno 與 Stockton 至舊金山、奧克蘭與 Sacramento, 共長 587 km)。
- (3) 海岸廊道 (由洛杉磯經 Union Pacific Railroad 到舊金山與奧克蘭, 共長 756 km)。
- (4) Capitol 廊道 (由 San Jose 經奧克蘭與 Sacramento, 跨越 Union Pacific Railroad 線, 到 Auburn, 路線共長 277 km)。

(資料來源：ASCE Civil Engineering, May 2001)

相信假以時日，加州交通必定能較現今更為通暢，擁塞情形與噪音情況更能改善。

### 三、加州奧克蘭市噪音管制處理實務研習：

拜訪時間：九十二年八月六日  
拜訪單位：奧克蘭市社區經濟發展局 City of Oakland Community & Economic Development Agency  
拜訪對象：翁卡文, 奧克蘭市社區經濟發展局 建築公共服務部部長 (Calvin N. Wong, P. E. Director of Building Services City of Oakland Community & Economic Development Agency)

奧克蘭市位於舊金山灣東邊，和舊金山以海灣大橋 (Bay Bridge) 相接，是加州的第五大城，因犯罪率高，住屋老舊，一向

給人暴力與貧窮的印象，且噪音問題譯音人口居住較為密集，而顯得較為嚴重。

根據威斯康辛大學的一項調查則指出：奧克蘭市是全美最多族裔聚居之處，文化極具多元性；由於房價較舊金山市低，近年來市政府努力打擊犯罪近十年來，奧克蘭更像一塊磁石般，吸引大批追求社會、政治和種族平等的人群來此定居，使它具有「發展最快的城市」之譽。

如今的奧克蘭正在努力消彌高犯罪率，並實施都市更新計畫，俾便早日擠入國際級都市之列。事實上，經過幾年努力，它已面貌一新，就像整容過之美女般令人刮目相看。現今它正如東灣一顆明珠，熠熠生輝，吸引著世人奔向它的懷抱。

依據奧克蘭市社區經濟發展局，建築公共服務部部長翁卡文所提供之「環保署典型社區噪音管制條例」(The Environmental Protection Agency's Model Community Noise Control Ordinance)中，將噪音定義為「任何打擾或擾亂人類，或產生危害人們心理及身體反應之聲音，稱為噪音」(“Noise” means: Any sound which annoys or disturbs humans or which causes or tends to cause an adverse physiological effect on humans)。

依據翁卡文部長所提供之噪音減少計畫 (Noise Abatement Program) 摺頁所示，奧克蘭市對噪音之管制一如我國一般，只要是噪音源發出超過噪音管制標準值之聲音，皆稱為噪音。固定噪音源之音量可以噪音計測量得之，而暫時性且不連續之噪音則無法以噪音值作為判定標準。

茲將奧克蘭市噪音管制值列表如下：

表二、奧克蘭市噪音管制值 (分貝 (dB(A))) (針對固定噪音源)

住宅及都會區噪音標準	最大噪音	容許值 (dB(A))
在日間或夜間一小時時間內之累積量測分鐘數(分)	日間 (Daytime)	夜間 (Nighttime)
	上午七時至 夜間十時	夜間十時至 上午七時
20	60	45
10	65	50
5	70	55
1	75	60
0	80	65
商業用途	任何 時刻	
20	65	
10	70	
5	75	
1	80	
0	85	
製造利用型農業用途	任何 時刻	
20	70	
10	75	
5	80	
1	85	
0	90	

資料來源：奧克蘭市噪音減少計畫 (Noise Abatement Program)

此外，奧克蘭市一如我國一般，設置有 24 小時公害陳情專線，接受民眾對於固定噪音源噪音及暫時性噪音之陳情，固定性噪音源由環保局相關人員以噪音計量測，並以噪音相關管制法規管制之，暫時性噪音則由警察及社區管理部門等相關單位管制之；此點與我國依據噪音管制法第四條規定，不具持續性且不易量測之聲音，由警察機關依相關規定管制之之管制方式相同。

#### 四、美國政府噪音污染管制政策及環境音量監測實務及操作系統研習：

拜訪時間：九十二年八月八日

拜訪單位：美國環保署 (U. S. Environmental Protection Agency)

拜訪對象：

(一) 楊仁泰博士，資深計畫經理，國際事務辦公室

Dr. Jentai Yang, Senior Program Manager, Office of International Affairs (OIA 2650R)

(二) 費斯先生，空氣及輻射辦公室，美國環保署 (Kenneth E. Feith, Office of Air and Radiation)

美國管制噪音之聯邦相關法規包括：1972 年制定頒布之「噪音管制法」(Noise Control Act, 1972)，1978 年「寧靜社區法」，以各種高速公路和航空法令(美國住宅及都市發展部，1985)。1972 年噪音管制法指示美國環保署需善盡改善噪音問題，以使所有美國人免於噪音危及健康及福祉的環境。且要求制定噪音判定基準值，俾便在不需考慮成本或可行性，便有足夠的空間可以維護健康及福祉。

於 1978 年所制定之「寧靜社區法」，則修正 1972 年噪音管制法之噪音管制方案，除聯邦政府之層級外，需擴及州及社區之層次。於 1970 年聯邦補助高速公路法及隨後修正之法令，要求所有聯邦補助之高速公路，必須將噪音管制作為規劃及設計之部分體

制。此外，1979年之「航空安全及噪音消滅法」，要求聯邦航空署(FAA)發展不同情況，以量測航空噪音的單一系統，並準備公布噪音地圖；強調航空噪音之消滅對策。

此外，於1980年開發計畫中考量噪音防制(Federal Interagency Committee on Urban Noise, 1980)，規定於進行土地利用時，包括美國環保署，交通部(FAA及FHWA)，住宅及都市發展部，國防部，及退輔會等數個中央部會，需同意聯合協力透過這個合作組織，發展出諸如噪音管制分區及土地利用相容性導引等噪音影響相關資訊。來土地利用的建議準則(U. S. Department of Transportation, 1992)。

一般而言，美國噪音管制已非聯邦政府之層級所主管，不同州、不同城市有不同之噪音管制標準，而愈低層級之單位，所訂定之噪音管制標準必須加嚴，並不可違背更高層之噪音管制法令，此點與我國之管制方式有所差異，我國噪音管制法及施行細則皆由行政院環境保護署所制定，地方可依據母法及子法相關規定，辦理噪音管制區劃定，公告相關設施、場所之噪音管制項目，但亦與美國相同，縣市所訂定之標準一定要較本署所訂定之法規為嚴，並不可違背噪音管制法及相關法規之精神。

經洽詢美國環保署相關人士表示，美國目前唯一了解且處理相關噪音事務之專家為空氣及輻射辦公室之費斯先生(Kenneth E. Feith)，依據費斯先生所提供美國環保署1976年所出版之有關聲音(about SOUND)之文件所示，美國環保署將噪音(NOISE)定義為：任何不為人所想要的聲音，因為此種聲音會干擾人們交談、演講或足以對聽力造成傷害，總而言之，是一種擾人的聲音(Any sound that is undesirable because it interferes with speech and hearing, or is intense enough to damage hearing, or is otherwise annoying)。

美國聯邦政府，已於約二十年前即縮減噪音預算，於聯邦政府內亦未如我國一般，設立噪音陳情專線、環保論壇及電子郵件鄉相等接受民眾申訴之管道，民眾遭遇噪音問題，第一個想到要投訴的對象也不是美國環保署，而是當地之州政府，或地方政府

環保局等相關環保單位，並有許多噪音事件，皆係由警察機管進行處理及管制，此點與我國之情況迥異；此外，因美國噪音管制法規並未如我國噪音管制法施行細則第八條，規定各地方環保單位需按季進行環境及交通噪音之監測，故目前並未尋獲美國相關環境及交通噪音之長期監測資料，對於歷年來之噪音污染狀況亦不得而知，惟工商業進步，時代變遷之情形下，據費斯先生表示，於美國之噪音陳情案件亦相對增加，地方政府對噪音管制業務之重視度亦日益提昇。

美國環保署楊仁泰博士及費斯先生亦提供了有關 1972 年至 1982 年美國環保署噪音出版品之參考書目 (Bibliography of Noise Publications, United States Environmental)，對於未來深入研究噪音相關管制項目及方式，提供了一個相當好的資料來源，俾便作為未來噪音管制及擬定噪音相關法規之參考。

## 五、馬里蘭州政府噪音污染管制機制研習：

拜訪時間：九十二年八月十一日上午

拜訪單位：馬里蘭州政府環境部 (Maryland Department of the Environment )

拜訪對象：蔡史坦立博士,部長 (Dr. Stanley Tsai, Administrator)  
喬治哈曼先生，計畫經理 (George Harman, Program Manager)  
結瑞克戴夫先生，噪音稽查員 (Dave Jarinko ,  
Noise Control Inspector)

依據喬治哈曼先生 (George Harman, Program Manager) 及結瑞克戴夫先生 (Dave Jarinko) 所著之馬里蘭州噪音計畫 (Maryland Noise Program) 所示，馬里蘭州之噪音主要由州政府環境部進行管制，其中結瑞克戴夫先生為馬里蘭州唯一一位噪音稽查人員，據其表示，該州政府常接到民眾噪音陳情案件，包括：營業場所噪音、七點以前的營建工程噪音、除草機噪音、早晨七點以前垃圾車收垃圾之噪音、教堂鐘聲、寵物叫聲等等。

該州政府針對 Ldn 中之日間係定義為上午七時至夜間十時，夜間係定義為夜間十時至上午七時，夜間加權十分貝，此與美國地區一般噪音管制方式相同。而該州政府將噪音定義為：噪音是一種聲音的強度、頻率、期間及性質，包括聲音及不易聽見之聲音的頻率 (Noise means the intensity, frequency, duration, and character of sound, including sound and vibration of sub-audible frequencies)，且規定噪音計之規格需符合 ANSI (American National Standards Institute) S1.4 之規定。

馬里蘭州政府所訂定之環境噪音容許值如下：

表三、 馬里蘭州環境噪音標準

區域別 Zoning District	噪音值 (dBA)	量測期間
工業區 Industrial	70	Leq(24)
商業區 Commercial	64	Ldn
住宅區 Residential	55	Ldn

資料來源：Maryland Noise Program

#### 六、馬里蘭州政府高速公路噪音污染管制機制研習：

拜訪時間：九十二年八月十一日下午

拜訪單位：馬里蘭州運輸部 (Maryland Department of the Environment )

拜訪對象：波卡克先生, 環境分析師，馬里蘭州運輸部，州立高速公路局 Kenneth D. Polcak , Environmental Analyst , State Highway Administrator , Maryland Department of Transportation)

如前所述，於 1970 年聯邦補助高速公路法及隨後修正之法令，要求所有聯邦補助之高速公路，必須將噪音管制作為規劃及設計之部分體制。

依據交通噪音分析議定書 (Traffic noise analysis protocol) 規定，當高速公路興建時，於既有之公私立小學及中學室內量測噪音值，皆不得超過 52 分貝。

依據波可克先生所提供之高速公路交通噪音 (Highway Traffic Noise) 可見，造成高速公路交通噪音污染之主要原因包括：

- (一) 車流量 (the volume of the traffic)
- (二) 車速 (the speed of the traffic)
- (三) 在車流中之卡車數量 (the number of trucks in the flow of the traffic)

一般而言，車流量大、車速快、卡車數量多皆會造成較高之高速公路交通噪音。此交通噪音係由引擎、油耗及輪胎所產生。

依據聯邦高速公路局所規範之高速公路交通噪音準則，一般居民所能承受之高速公路噪音， $Leq$  為 67 分貝， $L_{10}$  為 70 分貝；若為營業或娛樂場所，則所能承受之高速公路噪音， $Leq$  為 72 分貝， $L_{10}$  為 75 分貝。

而利用機動車輛之控制、土地利用之控制及高速公路規劃設計，如緩衝區之設立與隔音設施之構築，皆則能有效降低交通噪音。而此主管機關則包括聯邦 (Federal)、州 (States) 及地方 (Local) 政府之權責。

隔音設施之材質包括：木質隔音牆、水泥隔音牆、石材隔音牆、金屬隔音牆及以綠籬形成之隔音設施；一般隔音牆至少應使交通噪音減少 3 分貝，有效之隔音牆能減少道路交通噪音 10 至 15 分貝，甚至可以降低一半高速公路噪音；若利用一個 200 呎寬的綠籬以形成隔音設施，則可以降低 10 分貝；一般高速公路隔音牆之高度限制為 25 呎。



## 七、哥倫比亞區污水處理廠噪音監測實務及操作系統研習：

拜訪時間：九十二年八月十二日上午

拜訪單位：哥倫比亞區污水處理廠(District of Columbia, Water and Sewer Authority )

拜訪對象：張清奇博士，計畫及設計部主管(Dr. Chein-Chi Chang, Planning and Design)

所輪史記華資，公共衛生專家，安全衛生部門 (Sorin Schwartz, Industrial Hygienist、Department of Occupational Safety and Health)

哥倫比亞區污水處理廠為位於美國東岸數個規模非常大的污水處理廠之一，主要處理美國包括馬里蘭州及華盛頓特區等重要都會區之生活及工業污水；為維護廠區內員工之工作環境安寧，特由相關公共衛生專家及人員，使用db-3080等相關噪音監測儀器進行廠區內噪音之定期檢測，以減少職業傷害，並避免職工聽力受損。

依據哥倫比亞區污水處理廠張清奇博士及所輪史記華資 (Sorin Schwartz) 表示，於美國工廠廠區內之噪音管制主管機關為美國勞工部職業安全與健康署 (U.S. Department of Labor-Occupational Safety & Health Administration) (以下簡稱 OSHA) 管制，此點與我國室內工作場所主管機關為行政院勞委會之管制方式相似。

依據OSHA針對職業工作場所噪音暴露值之規定，若噪音暴露時間與量測所得之噪音分貝數高過以下表列值，則需提供個人噪音防護設備，以減少噪音所對人造成之傷害。

表四、OSHA針對職業工作場所規定可容許之噪音暴露值  
(Permissible Noise Exposures)

每日暴露期間 (Duration per day , hours)	噪音值 (Sound level Dba slow response)
8	90
6	90
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

資料來源：[www.osha.gov](http://www.osha.gov) 網頁 (表G-16)

此外，世界衛生組織 (World Health Organization, WHO) 自1970年代起開始注意環境噪音問題。環境噪音來源包括道路、鐵路、飛機、工廠、建築工地及近鄰噪音。世界上許多國家均立法管制來自道路、鐵路、建築工地與工廠排放之噪音，或制定包括隔音設備或建築物防音規範，但近鄰噪音則由於定義、量測及管制上的困難，而很少有國家訂定法規標準。此點與我國管制方式向相似，有些僅能以公告管制噪音行為。根據世界衛生組織於西元1999年出版之「Guideline for Community Noise」指出，歐洲國家在各項噪音源中，最嚴重的為交通噪音。在歐盟 (Europe Union) 國家中，約有40%的人口是處在日間時段交通噪音55dB (A) 的環境之中，而處在65dB (A) 以上環境的人口有20%。「Guideline for Community Noise」中根據不同環境型態，提出建議噪音容許值，以保護民眾避免受到噪音之污染，其中針對工業區，室內音量建議為70分貝，針對住宅及臥房內，建議為30至30分貝；茲將此建議噪音容許值列舉如下。

表五、WHO, "Guidelines for Community Noise", 1999  
針對不同環境型態下的建議噪音容許值

環境型態	對健康的影響	均能音量 dB (A)	量測時間 (小時)	最大音 量， 快特性 dB (A)
戶外生活區域	嚴重干擾	55	16	—
	中度干擾	50	16	—
住宅(室內)	談話清晰度及中度 干擾，白天及傍晚	35	16	—
臥房內	睡眠干擾，夜間	30	8	45
教室及幼稚園內	談話清晰度不佳，妨 礙上課	35	上課時間	—
學校遊戲區(室 外)	干擾	55	遊戲時間	—
醫院病房(室內)	干擾睡眠(夜間)	30	8	40
	干擾睡眠(白天及傍 晚)	30	16	—
醫院診療室(室 內)	妨礙休息及體力回 復	#1		
工業區、商業購 物區及交通要道 (室內及室外)	聽力損害	70	24	110
典禮、慶典、娛 樂活動	聽力損害	100	4	110
公眾演說(室內 及室外)	聽力損害	85	1	110
玩具、煙火、火 器衝擊音	聽力損害(成人)	—	—	140#2
	聽力損害(小孩)	—	—	120#2
公園及保護區	破壞安寧	#3		

環境型態	對健康的影響	均能音量 dB (A)	量測時間 (小時)	最大音量， 快特性 dB (A)
#1：音量儘可能愈低愈好。 #2：尖峰音量，距離耳朵 10cm 處量測。 #3：既有的安寧戶外區域必須保持低音量。 #4：有耳機情形下，自由音場值。				

資料來源：WHO, "Guidelines for Community Noise", 1999

而依據美國環保署針對個人在不同狀況下，所建議之個人室內噪音暴露值為：

**表六、個人不同狀況之個人室內噪音暴露值**  
**(Hypothetical examples of noise exposures of individuals)**

24 小時平均音量, dB

個人	鄉村環境	都市環境
工廠工人	87	87
辦公室工人	72	70
家庭主婦	64	67
學校學生	77	77

資料來源：Protective noise levels-condensed version of EPA levels documents, EPA 550/9-79-100

#### 八、參訪駐紐約台北經濟文化辦事處，了解紐約相關機構噪音管制方式：

拜訪時間：九十二年八月十三日

拜訪單位：駐紐約台北經濟文化辦事處 (Taipei Economic and Cultural Office in New York)

拜訪對象：藍夏禮秘書 (Peter Lan, Senior Assistant to the Director General)

一般而言，在美國與因土地利用所產生之噪音問題息息相關之管制主管機關包括：

- (一) 國防部 (Department of Defense-DOD)
- (二) 住都局 (Department of Housing and Urban Development-HUD)
- (三) 環保署 (Environmental Protection Agency-EPA)
- (四) 交通部聯邦航空署 (Department of Transportation/Federal Aviation Administration DOT/FAA)
- (五) 交通部聯邦高速公路局 (Department of Transportation/Federal Highway Administration DOT/FHWA)
- (六) 退輔會 (Veteran Administration)

紐約市之噪音問題是美國大都會區內噪音污染最嚴重的都市之一，計程車司機案喇叭的情況隨時可見，除了噪音問題，隨手可見民眾丟棄煙蒂，市容相較於我國之台北市而言實在髒亂許多。

紐約市之噪音管制單位為紐約市環保局，紐約都會區內亦無相關之環境及交通噪音監測站，噪音由相關稽查人員進行檢測。

## 九、環境音量監測實務研習：

拜訪時間：九十二年八月十四日上午

拜訪單位：紐澤西州立大學，環境噪音中心 (The State University of New Jersey, Rutgers Noise Technical Assistance Center Department of Environmental Sciences )

拜訪對象：日瓦林教授 (Eric M. Zwierling, professor)

陪同專家：美國能源部李正民博士 (U.S.DOE, Dr. John Lee)

日瓦林教授為紐澤西州立大學環境噪音中心的教授，主要教導有關噪音之課程，也進行許多噪音監測及檢測之相關工作，依據該教授所編著之社區噪音檢測實施計畫 (Community Noise Enforcement) 所示，於 1974 年，依據美國環保署之評估，有超過一億美國人居住於超過美國環保署定義之 55 分貝-安全日夜音量 (Ldn Day Night Level) 之

環境中；而於 1990 年，此人口數經評估已超過一億三千八百萬人。可見噪音問題正在日益提昇當中。

日瓦林教授將噪音定義為任何不想要之聲音 (Noise is any unwanted sound)，更是一種對耳朵造成之污染，其對環境音量監測設定一些相關的量測及天氣條件之需求如下：

(一) 量測儀器規定：

1. 噪音計：

(1) 需符合 ANSI S1.4-1983 之規定。

(2) 需包括 Type II (一般用途) 及 Type I (精確型)

2. 噪音校正儀：需適用噪音計之製造商之規範。

3. 風向儀：

(1) 需適用噪音計之製造商之規範。

(2) 需為球型或圓柱型。

(3) 麥克風分貝及頻率不得超過：

+/- 1.0 d BA 頻率：20-4,000Hz

+/- 1.5 d BA 頻率：4,000-10,000Hz

4. 風速測定計

(二) 天氣條件：

1. 風：一般而言，風速限制為 12 MPH。

2. 溫度：需能使噪音計內部溫度調整接近鄰近之溫度。

3. 溼度：大多數噪音計能於相對溼度百分之九十的狀況下操作。

4. 降雨：因為包括麥克風及風球等儀器並不防水，所以任何噪音監測不可於雨天進行。

5. 電磁場：不可以在變壓器、收音機、電視、電塔附件量測噪音值，以避免受干擾。

(三) 誤差範圍：

1. 使用 Type I (精確型) 儀器量測時之誤差範圍為 +/- 1 分貝。

2. 使用 Type II (一般用途) 儀器量測時之誤差範圍為 +/- 2 分貝。

(四) 進行背景音量之修正：一般量測值包括背景噪音值 (background, 以下簡稱 B) 及完整讀值 (total, 以下簡稱 T), 紀錄實際噪音量測值時需進行背景音量之修正。

1.若  $T-B \geq 10$  分貝, 則不需進行背景音量之修正, 噪音計之讀值則為實際測值。

2.若  $T-B < 3$  分貝, 則無法進行校正。

茲將背景音量修正值列表如下：

表七、背景音量修正值

完整讀值與背景噪音值之差異 (dBA)	完整讀值需扣除之差異值 (dBA)
0-2	音源小於背景值, 此測值不予紀錄
3	3
4,5	2
6-9	1
10 或更高	0

資料來源：Community Noise Enforcement, Eric M. Zwerling, June, 2003

上述表格之規定與我國噪音管制標準, 有關背景音量修正值之規定完全相同, 故建議測定場所之背景音量, 最好與預測定音源之音量相差十分貝以上, 如不得已相差在十分貝以內, 則依上表進行修正; 若相差在三分貝以內, 則建議另擇時間或地點重新監測。

## 十、研習紐約市噪音管制實務：

拜訪時間：九十二年八月十四日下午

拜訪單位：紐約市環保局（New York Department of Environmental Protection）

拜訪對象：裘藍丁.克羅平,紐約市環保局局長（E Geraldine Kelpin, Director, New York Department of Environmental Protection）

陪同專家：美國能源部李正民博士（U.S.DOE, Dr. John Lee）

依據紐約市環保局局長裘藍丁.克羅平所提供之紐約市噪音管制資料將噪音定義為：不規律性、間歇性、統計學上隨意之振動（Noise means an erratic, intermittent, or statically random oscillation）。

依據美國紐約市噪音法（Noise Code, 1998）第六章，有關環境噪音品質區（Ambient Noise Quality Zone），係基於現有土地利用情形而進行各類噪音品質區之分類。其分區分類方式如下所述

1.N-1 區：低密度住宅區。

2.N-2 區：高密度住宅區。

3.N-3 區：所有商業區及工業區。

3.其它區：其它類土地利用，關於該區內的噪音品質標準及準則須由土地管理者向市議會提出。

表八、紐約市噪音品質區

單位：dB (A)

時段 噪音品 質區	日間 (07:00am~10:00pm)	夜間 (10:00am~07:00am)
N-1	60	50
N-2	65	55
N-3	70	70

註：1.表中數值為該時段內任一小時之小時均能音量。

2.測量時應去除鳥叫、雷鳴位於及該區域之外的高速公路噪音、飛航噪音。



至於紐約市噪音之管制方式，依據紐約環保局局長表示，紐約之管制主要以兩種方式進行，以產生噪音之行為或來源進行管制，或以噪音值進行管制標準，茲簡要說明如下（主要參考美國紐約市噪音法（Noise Code, 1998）第二章-Noise control）：

（一）以產生噪音之行為或來源進行管制：如

- 1.動物：規定任何人可以允許其所能控制的動物（甚至包括一隻鳥），去製造或發出不悅耳或不適宜之聲音：
- 2.緊急救護設備：非緊急需要，不得製造或發出不悅耳或不適宜之聲音，且時間不得超過此緊急事件所需反應之時間。
- 3.營建工程：除非特殊情況發生，如因為公共安全需緊急施工，且經紐約環保局許可，否則在任何區域，營建工程皆僅可於每週之上班日（weekends）實施，且營建工程之執行時間僅限於上午七時至晚上六時，其他時段係完全禁止；上述因緊急狀況之施工時間亦不得超過十二小時；此點與我國利用營建工程作為管制標準，而非以時段作為完全禁止營建工程施工之規定有所不同。
- 4.草地維護設備：此乃因美國當地有許多住戶，皆於住宅區內有草坪，需用除草機等相關設施，故規定於早上八時前及晚上七時或日落後，不得於住宅區內使用相關草坪維護設備；而於公園或公有休閒遊憩場所雇工進行草坪修剪等事宜時，則不得於早上七時至晚上八時進行之。

（二）以噪音值進行管制標準：此與我國管制主要噪音源之方式類似：

- 1.汽車、2.航空器、3.快速鐵路、4.鐵路、5.空氣壓縮機、6.循環設施、7.壓縮機、8.緊急訊號設施、9.娛樂及營業設施

此外，如前所述，紐約市環保局亦未設置任何有關環境及交通噪音之固定或按季進行監測工作，與我國內各環保局依照噪音管制法施行細則規定，按季進行監測之方式有明顯之差異。

## 伍、結論與建議

- 一、綜觀現今所產生之噪音問題，於世界各先進國家皆因工商業發達，人口集中於都會區，而使噪音問題日益嚴重，噪音陳情案件亦日益增加。
- 二、為因應日益增加的噪音陳情案件，歐、美、日等先進國家皆已訂定相關噪音管制法規，並針對不同的噪音源、不同的時段訂定不同的噪音管制標準。香港環保署針對「可接受的噪音等級」，將分貝數定於 50 至 70 分貝之間；與我國訂定一般地區介於 40 至 75 分貝間之環境音量標準相較，本國標準較為嚴苛，尤以第一類管制區管制標準最嚴。
- 三、另依據「日本噪音環境基準」規定，不同地區類型的噪音基準以時段區分，一般地區環境基準指標值：白天介於 50 至 60 分貝，晚上介於 40 至 50 分貝間；與本署訂定之一般地區介於 40 至 75 分貝之間相較，本署標準較寬，尤以第四類管制區標準介於 65 至 75 分貝最寬。
- 四、而與美國紐約市相較，則如前文所述，依據美國紐約市噪音法關於環境噪音品質區之規定，日間介於 60 至 70 分貝，晚上介於 50 至 70 分貝間，與我國一般地區環境音量標準之第二、三、四類管制區日間音量幾乎相同，僅第四類管制區中我國標準較寬。
- 五、本署為提昇民眾生活品質、確保環境安寧，對於噪音管制業務之推動實不遺餘力，各個環保單位的同仁亦為此目標而共同奮鬥，目前本署及各個環保單位皆設有二十四小時公害陳情案件，民眾可隨時反應噪音污染之狀況，並由環保人員即時解決問題；此外，依據噪音管制法施行細則第八條規定，直轄市、縣（市）主管機關應於所轄管制區內，選定適當地點，指定環境及交通噪音監測點，依規定辦理監測，並定期陳報本署；此點於本次研習過程中並未有任何一個都會區或城市，有如此監測站之設置等的相關規定；經由上述監測結果，

本署可了解各縣市當地長期環境及交通噪音現況，並督促各環保機關進行檢討及加強對噪音源之管制，以減少噪音對民眾生活環境安寧造成之影響。

六、噪音問題之解決有待大家一起共同努力，未來本署亦將持續留意國際研究成果與發展趨勢，並配合我國之都市計畫發展現況與污染狀況，適時修正我國噪音管制法及噪音管制標準等相關子法及規定，以符合民眾生活實際狀況需求，並與世界潮流接軌。

後記:因噪音業務於美國已非聯邦政府之層級管制,且美國除大都會區外,一般而言,人口不及台灣之密集,噪音問題亦相對不是如此嚴重,所以要找到與噪音管制業務相關之單位,實為不易,本次參訪行程,於密切聯繫與戮力安排下,承蒙美方相當多專家學者全力相助,才得以成行並有相當多之收穫。

另本次之行,一個叫人終身難忘之經驗為,本人於紐約參訪,完成本計畫所有行程後,適逢紐約二十多年來第一次東北地區大停電,幸好本人與美國能源部李博士為了先完成拜會行程,且因紐澤西州立大學與紐約市環保局距離十分遙遠,相距車程約二小時,故吾等二人到下午四時才用餐,故本人相當幸運的未被困在紐約地鐵中,遽聞有人行走約六小時,方才抵達地面;這十五天的行程,密集而又緊湊,真是個令人難忘又收穫良多的研習。

## 陸、附件

附件一：美國環保署噪音污染管制相關文件

- (一) USEPA Noise Control Act of 1982
- (二) The environmental Protection Agency's Model Community Noise Ordinance
- (三) Protective Noise Levels-  
Condensed Version of EPA Level Documents
- (四) Bibliography of Noise Publication

附件二：加州奧克蘭噪音污染管制- Noise Abatement Program

附件三：交通噪音管制-

- (一) Highway Traffic Noise
- (二) Guidelines For Considering Noise in Land Use Planning and Control

附件四：馬里蘭州政府噪音污染管制相關文件—

Maryland Department of Transportation State  
Highway Administration

附件五：紐約市噪音管制-NYC Chapter 2-Noise Control

附件六：紐澤西州立大學環境音量監測參考文獻—

Community Noise Enforcement-  
The States of New Jersey Rutgers

附件七：美方專家學者名片影本

附件八：研習活動照片



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COMPILATION OF SELECTED ACTS  
WITHIN THE JURISDICTION OF THE  
COMMITTEE ON COMMERCE

ENVIRONMENTAL LAW

INCLUDING

CLEAN AIR ACT  
SOLID WASTE DISPOSAL ACT  
POLLUTION PREVENTION ACT OF 1990  
TOXIC SUBSTANCES CONTROL ACT  
NOISE CONTROL ACT OF 1972  
SAFE DRINKING WATER ACT  
COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPEN-  
SATION, AND LIABILITY ACT OF 1980 (SUPERFUND)  
SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF  
1986 (SARA)

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<sup>1</sup>This table of contents is not part of the Noise Control Act of 1972 but is set forth for the convenience of the users of this publication.

NOISE CONTROL ACT OF 1972

## NOISE CONTROL ACT OF 1972<sup>1</sup>

### SHORT TITLE

SECTION 1. This Act may be cited as the "Noise Control Act of 1972".

[42 U.S.C. 4901 note]

### FINDINGS AND POLICY

SEC. 2. (a) The Congress finds—

(1) that inadequately controlled noise presents a growing danger to the health and welfare of the Nation's population, particularly in urban areas;

(2) that the major sources of noise include transportation vehicles and equipment, machinery, appliances, and other products in commerce; and

(3) that, while primary responsibility for control of noise rests with State and local governments, Federal action is essential to deal with major noise sources in commerce control of which require national uniformity of treatment.

(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. To that end, it is the purpose of this Act to establish a means for effective coordination of Federal research and activities in noise control, to authorize the establishment of Federal noise emission standards for products distributed in commerce, and to provide information to the public respecting the noise emission and noise reduction characteristics of such products.

[42 U.S.C. 4901]

### DEFINITIONS

SEC. 3. For purposes of this Act:

(1) The term "Administrator" means the Administrator of the Environmental Protection Agency.

(2) The term "person" means an individual, corporation, partnership, or association, and (except as provided in sections 11(e) and 12(a)) includes any officer, employee, department, agency, or instrumentality of the United States, a State, or any political subdivision of a State.

(3) The term "product" means any manufactured article or goods or component thereof, except that such term does not include—

<sup>1</sup>The Noise Control Act of 1972 (42 U.S.C. 4901-4918) consists of Public Law 95-574 (Oct. 27, 1972) and the amendments made by Public Law 96-509 (Nov. 8, 1978).

describe the noise-control programs of each Federal agency and assess the contributions of those programs to the Federal Government's overall efforts to control noise.

[42 U.S.C. 4903]

IDENTIFICATION OF MAJOR NOISE SOURCES; NOISE CRITERIA AND CONTROL TECHNOLOGY

SEC. 5. (a)(1) The Administrator shall, after consultation with appropriate Federal agencies and within nine months of the date of the enactment of this Act, develop and publish criteria with respect to noise. Such criteria shall reflect the scientific knowledge most useful in indicating the kind and extent of all identifiable effects on the public health or welfare which may be expected from differing quantities and qualities of noise.

(2) The Administrator shall, after consultation with appropriate Federal agencies and within twelve months of the date of the enactment of this Act, publish information on the levels of environmental noise the attainment and maintenance of which in defined areas under various conditions are requisite to protect the public health and welfare with an adequate margin of safety.

(b) The Administrator shall, after consultation with appropriate Federal agencies, compile and publish a report or series of reports (1) identifying products (or classes of products) which in his judgment are major sources of noise, and (2) giving information on techniques for control of noise from such products, including available data on the technology, costs, and alternative methods of noise control. The first such report shall be published not later than eighteen months after the date of enactment of this Act.

(c) The Administrator shall from time to time review and, as appropriate, revise or supplement any criteria or reports published under this section.

(d) Any report (or revision thereof) under subsection (b)(1) identifying major noise sources shall be published in the Federal Register. The publication or revision under this section of any criteria or information on control techniques shall be announced in the Federal Register, and copies shall be made available to the general public.

[42 U.S.C. 4904]

NOISE EMISSION STANDARDS FOR PRODUCTS DISTRIBUTED IN COMMERCE

SEC. 6. (a)(1) The Administrator shall publish proposed regulations, meeting the requirements of subsection (c), for each product—

(A) which is identified (or is part of a class identified) in any report published under section 5(b)(1) as a major source of noise,

(B) for which, in his judgment, noise emission standards are feasible, and

(C) which falls in one of the following categories:

- (i) Construction equipment.
- (ii) Transportation equipment (including recreational vehicles and related equipment).

(iii) Any motor or engine (including any equipment of which an engine or motor is an integral part),

(iv) Electrical or electronic equipment.

(2)(A) Initial proposed regulations under paragraph (1) shall be published not later than eighteen months after the date of enactment of this Act, and shall apply to any product described in paragraph (1) which is identified (or is a part of a class identified) as a major source of noise in any report published under section 5(b)(1) on or before the date of publication of such initial proposed regulations.

(B) In the case of any product described in paragraph (1) which is identified (or is part of a class identified) as a major source of noise in a report published under section 5(b)(1) after publication of the initial proposed regulations under subparagraph (A) of this paragraph, regulations under paragraph (1) for such product shall be proposed and published by the Administrator not later than eighteen months after such report is published.

(3) After proposed regulations respecting a product have been published under paragraph (2), the Administrator shall, unless in his judgment noise emission standards are not feasible for such product, prescribe regulations, meeting the requirements of subsection (c), for such product—

(A) not earlier than six months after publication of such proposed regulations, and

(B) not later than—

(i) twenty-four months after the date of enactment of this Act, in the case of a product subject to proposed regulations published under paragraph (2)(A), or

(ii) in the case of any other product, twenty-four months after the publication of the report under section 5(b)(1) identifying it (or a class of products of which it is a part) as a major source of noise.

(b) The Administrator may publish proposed regulations, meeting the requirements of subsection (c), for any product for which he is not required by subsection (a) to prescribe regulations but for which, in his judgment, noise emission standards are feasible and are requisite to protect the public health and welfare. Not earlier than six months after the date of publication of such proposed regulations respecting such product, he may prescribe regulations, meeting the requirements of subsection (c), for such product.

(c)(1) Any regulation prescribed under subsection (a) or (b) of this section (and any revision thereof) respecting a product shall include a noise emission standard which shall set limits on noise emissions from such product and shall be a standard which in the Administrator's judgment, based on criteria published under section 5, is requisite to protect the public health and welfare, taking into account the magnitude and conditions of use of such product (alone or in combination with other noise sources), the degree of noise reduction achievable through the application of the best available technology and the cost of compliance. In establishing such a standard for any product, the Administrator shall give appropriate consideration to standards under other laws designed to safeguard the health and welfare of persons, including any standards under the National Traffic and Motor Vehicle Safety Act of

1966, the Clean Air Act, and the Federal Water Pollution Control Act. Any such noise emission standards shall be a performance standard. In addition, any regulation under subsection (a) or (b) (and any revision thereof) may contain testing procedures necessary to assure compliance with the emission standard in such regulation, and may contain provisions respecting instructions of the manufacturer for the maintenance, use, or repair of the product.

(2) After publication of any proposed regulations under this section, the Administrator shall allow interested persons an opportunity to participate in rulemaking in accordance with the first sentence of section 553(c) of title 5, United States Code.

(3) The Administrator may revise any regulation prescribed by him under this section by (A) publication of proposed revised regulations, and (B) the promulgation, not earlier than six months after the date of such publication, of regulations making the revision; except that a revision which makes only technical or clerical corrections in a regulation under this section may be promulgated earlier than six months after such date if the Administrator finds that such earlier promulgation is in the public interest.

(d)(1) On and after the effective date of any regulation prescribed under subsection (a) or (b) of this section, the manufacturer of each new product to which such regulation applies shall warrant to the ultimate purchaser and each subsequent purchaser that such product is designed, built, and equipped so as to conform at the time of sale with such regulation.

(2) Any cost obligation of any dealer incurred as a result of any requirement imposed by paragraph (1) of this subsection shall be borne by the manufacturer. The transfer of any such cost obligation from a manufacturer to any dealer through franchise or other agreement is prohibited.

(3) If a manufacturer includes in any advertisement a statement respecting the cost or value of noise emission control devices or systems, such manufacturer shall set forth in such statement the cost or value attributed to such devices or systems by the Secretary of Labor (through the Bureau of Labor Statistics). The Secretary of Labor and his representatives, shall have the same access for this purpose to the books, documents, papers, and records of a manufacturer as the Comptroller General has to those of a recipient of assistance for purposes of section 311 of the Clean Air Act.

(e)(1) No State or political subdivision thereof may adopt or enforce—

(A) with respect to any new product for which a regulation has been prescribed by the Administrator under this section, any law or regulation which sets a limit on noise emissions from such new product and which is not identical to such regulation of the Administrator; or

(B) with respect to any component incorporated into such new product by the manufacturer of such product, any law or regulation setting a limit on noise emissions from such component when so incorporated.

(2) Subject to sections 17 and 18, nothing in this section precludes or denies the right of any State or political subdivision thereof to establish and enforce controls on environmental noise (or

one or more sources thereof) through the licensing, regulation, or restriction of the use, operation, or movement of any product or combination of products.

(f) At any time after the promulgation of regulations respecting a product under this section, a State or political subdivision thereof may petition the Administrator to revise such standard on the grounds that a more stringent standard under subsection (c) of this section is necessary to protect the public health and welfare. The Administrator shall publish notice of receipt of such petition in the Federal Register and shall within ninety days of receipt of such petition respond by (1) publication of proposed revised regulations in accordance with subsection (c)(3) of this section, or (2) publication in the Federal Register of a decision not to publish such proposed revised regulations at that time, together with a detailed explanation for such decision.

[42 U.S.C. 4906]

#### AIRCRAFT NOISE STANDARDS

SEC. 7. (a) The Administrator, after consultation with appropriate Federal, State, and local agencies and interested persons, shall conduct a study of the (1) adequacy of Federal Aviation Administration flight and operational noise controls; (2) adequacy of noise emission standards on new and existing aircraft, together with recommendations on the retrofitting and phaseout of existing aircraft; (3) implications of identifying and achieving levels of cumulative noise exposure around airports; and (4) additional measures available to airport operators and local governments to control aircraft noise. He shall report on such study to the Committee on Interstate and Foreign Commerce of the House of Representatives and the Committees on Commerce and Public Works of the Senate within nine months after the date of the enactment of this Act.

(b) Section 611 of the Federal Aviation Act of 1958 (49 U.S.C. 1431) is amended to read as follows:

[42 U.S.C. 4906]

#### "CONTROL AND ABATEMENT OF AIRCRAFT NOISE AND SONIC BOOM

"SEC. 611. (a) For purposes of this section:

"(1) The term 'FAA' means Administrator of the Federal Aviation Administration.

"(2) The term 'EPA' means the Administrator of the Environmental Protection Agency.

"(b)(1) In order to afford present and future relief and protection to the public health and welfare from aircraft noise and sonic boom, the FAA, after consultation with the Secretary of Transportation and with EPA, shall prescribe and amend standards for the measurement of aircraft noise and sonic boom and shall prescribe and amend such regulations as the FAA may find necessary to provide for the control and abatement of aircraft noise and sonic boom, including the application of such standards and regulations in the issuance, amendment, modification, suspension, or revocation of any certificate authorized by this title. No exemption with respect to any standard or regulation under this section may be granted under any provision of this Act unless the FAA shall have con-

Policy Act of 1969 with respect to such action of the FAA under paragraph (1) of this subsection; and shall specify whether (and where) such statements are available for public inspection. The FAA's report shall be published in the Federal Register, except in a case in which EPA's request proposed specific action to be taken by the FAA, and FAA's report indicates such action will be taken.

"(3) If, in the case of a matter described in paragraph (2) of this subsection with respect to which no statement is required to be filed under such section 102(2)(C), the report of the FAA indicates that the proposed regulation originally submitted by EPA should not be made, then EPA may request the FAA to file a supplemental report, which shall be published in the Federal Register within such a period as EPA may specify (but such time specified shall not be less than ninety days from the date the request was made), and which shall contain a comparison of (A) the environmental effects (including those which cannot be avoided) of the action actually taken by the FAA in response to EPA's proposed regulations, and (B) EPA's proposed regulations.

"(c) In prescribing and amending standards and regulations under this section, the FAA shall—

"(1) consider relevant available data relating to aircraft noise and sonic boom, including the results of research, development, testing, and evaluation activities conducted pursuant to this Act and the Department of Transportation Act;

"(2) consult with such Federal, State, and interstate agencies as he deems appropriate;

"(3) consider whether any proposed standard or regulation is consistent with the highest degree of safety in air commerce or air transportation in the public interest;

"(4) consider whether any proposed standard or regulation is economically reasonable, technologically practicable, and appropriate for the particular type of aircraft, aircraft engine, appliance, or certificate to which it will apply; and

"(5) consider the extent to which such standard or regulation will contribute to carrying out the purposes of this section.

"(e) In any action to amend, modify, suspend, or revoke a certificate in which violation of aircraft noise or sonic boom standards or regulations is at issue, the certificate holder shall have the same notice and appeal rights as are contained in section 609, and in any appeal to the National Transportation Safety Board, the Board may amend, modify, or reverse the order of the FAA if it finds that control or abatement of aircraft noise or sonic boom and the public health and welfare do not require the affirmation of such order, or that such order is not consistent with safety in air commerce or air transportation."

LABELING

SEC. 8. (a) The Administrator shall by regulation designate any product (or class thereof)—

(1) which emits noise capable of adversely affecting the public health or welfare; or

(2) which is sold wholly or in part on the basis of its effectiveness in reducing noise.

sulted with EPA before such exemption is granted, except that if the FAA determines that safety in air commerce or air transportation requires that such an exemption be granted before EPA can be consulted, the FAA shall consult with EPA as soon as practicable after the exemption is granted.

"(2) The FAA shall not issue an original type certificate under section 603(a) of this Act for any aircraft for which substantial noise abatement can be achieved by prescribing standards and regulations in accordance with this section, unless he shall have prescribed standards and regulations in accordance with this section which apply to such aircraft and which protect the public from aircraft noise and sonic boom, consistent with the considerations listed in subsection (d).

"(c)(1) Not earlier than the date of submission of the report required by section 7(a) of the Noise Control Act of 1972, EPA shall submit to the FAA proposed regulations to provide such control and abatement of aircraft noise and sonic boom (including control and abatement through the exercise of any of the FAA's regulatory authority over air commerce or transportation or over aircraft or aircraft operations) as EPA determines is necessary to protect the public health and welfare. The FAA shall consider such proposed regulations submitted by EPA under this paragraph and shall, within thirty days of the date of its submission to the FAA, publish the proposed regulations in a notice of proposed rulemaking. Within sixty days after such publication, the FAA shall commence a hearing at which interested persons shall be afforded an opportunity for oral (as well as written) presentations of data, views, and arguments. Within a reasonable time after the conclusion of such hearing and after consultation with EPA, the FAA shall—

"(A) in accordance with subsection (b), prescribe regulations (i) substantially as they were submitted by EPA, or (ii) which are a modification of the proposed regulations submitted by EPA, or

"(B) publish in the Federal Register a notice that it is not prescribing any regulation in response to EPA's submission of proposed regulations, together with a detailed explanation providing reasons for the decision not to prescribe such regulations.

"(2) If EPA has reason to believe that the FAA's action with respect to a regulation proposed by EPA under paragraph (1)(A)(i) or (1)(B) of this subsection does not protect the public health and welfare from aircraft noise or sonic boom, consistent with the considerations listed in subsection (d) of this section, EPA shall consult with the FAA and may request the FAA to review, and report to EPA on, the advisability of prescribing the regulation originally proposed by EPA. Any such request shall be published in the Federal Register and shall include a detailed statement of the information on which it is based. The FAA shall complete the review requested and shall report to EPA within such time as EPA specifies in the request, but such time specified may not be less than ninety days from the date the request was made. The FAA's report shall be accompanied by a detailed statement of the FAA's findings and the reasons for the FAA's conclusions; shall identify any statement filed pursuant to section 102(2)(C) of the National Environmental

(b) For each product (or class thereof) designated under subsection (a) the Administrator shall by regulation require that notice be given to the prospective user of the level of the noise the product emits, or of its effectiveness in reducing noise, as the case may be. Such regulations shall specify (1) whether such notice shall be affixed to the product or to the outside of its container, or to both, at the time of its sale to the ultimate purchaser or whether such notice shall be given to the prospective user in some other manner, (2) the form of the notice, and (3) the methods and units of measurement to be used. Section 6(c)(2) shall apply to the prescribing of any regulation under this section.

(c) This section does not prevent any State or political subdivision thereof from regulating product labeling or information respecting products in any way not in conflict with regulations prescribed by the Administrator under this section.

[42 U.S.C. 4907]

#### IMPORTS

SEC. 9. The Secretary of the Treasury shall, in consultation with the Administrator, issue regulations to carry out the provisions of this Act with respect to new products imported or offered for importation.

[42 U.S.C. 4908]

#### PROHIBITED ACTS

SEC. 10. (a) Except as otherwise provided in subsection (b), the following acts or the causing thereof are prohibited:

(1) In the case of a manufacturer, to distribute in commerce any new product manufactured after the effective date of a regulation prescribed under section 6 which is applicable to such product, except in conformity with such regulation.

(2)(A) The removal or rendering inoperative by any person, other than for purposes of maintenance, repair, or replacement, of any device or element of design incorporated into any product in compliance with regulations under section 6, prior to its sale or delivery to the ultimate purchaser or while it is in use, or (B) the use of a product after such device or element of design has been removed or rendered inoperative by any person.

(3) In the case of a manufacturer, to distribute in commerce any new product manufactured after the effective date of a regulation prescribed under section 8(b) (requiring information respecting noise) which is applicable to such product, except in conformity with such regulation.

(4) The removal by any person of any notice affixed to a product or container pursuant to regulations prescribed under section 8(b), prior to sale of the product to the ultimate purchaser.

(5) The importation into the United States by any person of any new product in violation of a regulation prescribed under section 9 which is applicable to such product.

(6) The failure or refusal by any person to comply with any requirement of section 11(d) or 13(a) or regulations prescribed under section 13(a), 17, or 18.

(b)(1) For the purpose of research, investigations, studies, demonstrations, or training, or for reasons of national security, the Administrator may exempt for a specified period of time any product, or class thereof, from paragraphs (1), (2), (3), and (6) of subsection (a), upon such terms and conditions as he may find necessary to protect the public health or welfare.

(2) Paragraphs (1), (2), (3), and (4) of subsection (a) shall not apply with respect to any product which is manufactured solely for use outside any State and which (and the container of which) is labeled or otherwise marked to show that it is manufactured solely for use outside any State; except that such paragraphs shall apply to such product if it is in fact distributed in commerce for use in any State.

[42 U.S.C. 4909]

#### ENFORCEMENT

SEC. 11. (a)(1) Any person who willfully or knowingly violates paragraph (1), (3), (5), or (6) of subsection (a) of section 10 of this Act shall be punished by a fine of not more than \$25,000 per day of violation, or by imprisonment for not more than one year, or by both. If the conviction is for a violation committed after a first conviction of such person under this subsection, punishment shall be by a fine of not more than \$50,000 per day of violation, or by imprisonment for not more than two years, or by both.

(2) Any person who violates paragraph (1), (3), (5), or (6) of subsection (a) of section 10 of this Act shall be subject to a civil penalty not to exceed \$10,000 per day of such violation.

(b) For the purpose of this section, each day of violation of any paragraph of section 10(a) shall constitute a separate violation of that section.

(c) The district courts of the United States shall have jurisdiction of actions brought by and in the name of the United States to restrain any violations of section 10(a) of this Act.

(d)(1) Whenever any person is in violation of section 10(a) of this Act, the Administrator may issue an order specifying such relief as he determines is necessary to protect the public health and welfare.

(2) Any order under this subsection shall be issued only after notice and opportunity for a hearing in accordance with section 554 of title 5 of the United States Code.

(e) The term "person," as used in this section, does not include a department, agency, or instrumentality of the United States.

[42 U.S.C. 4910]

#### CITIZEN SUITS

SEC. 12. (a) Except as provided in subsection (b), any person (other than the United States) may commence a civil action on his own behalf—

- (1) against any person (including (A) the United States, and (B) any other governmental instrumentality or agency to the extent permitted by the eleventh amendment to the Constitution) who is alleged to be in violation of any noise control requirement (as defined in subsection (e)), or

RECORDS, REPORTS, AND INFORMATION

SEC. 13. (a) Each manufacturer of a product to which regulations under section 6 or section 8 apply shall—

- (1) establish and maintain such records, make such reports, provide such information, and make such tests, as the Administrator may reasonably require to enable him to determine whether such manufacturer has acted or is acting in compliance with this Act.
- (2) upon request of an officer or employee duly designated by the Administrator, permit such officer or employee at reasonable times to have access to such information and the results of such tests and to copy such records, and
- (3) to the extent required by regulations of the Administrator, make products coming off the assembly line or otherwise in the hands of the manufacturer available for testing by the Administrator.

(b)(1) All information obtained by the Administrator or his representatives pursuant to subsection (a) of this section, which information contains or relates to a trade secret or other matter referred to in section 1905 of title 18 of the United States Code, shall be considered confidential for the purpose of that section, except that such information may be disclosed to other Federal officers or employees, in whose possession it shall remain confidential, or under relevant to the matter in controversy in any proceeding under this Act.

(2) Nothing in this subsection shall authorize the withholding of information by the Administrator, or by any officers or employees under his control, from the duly authorized committees of the Congress.

(c) Any person who knowingly makes any false statement, representation, or certification in any application, record, report, plan, or other document filed or required to be maintained under this Act or who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this Act, shall upon conviction be punished by a fine of not more than \$10,000, or by imprisonment for not more than six months, or by both.

[42 U.S.C. 4912]

QUIET COMMUNITIES, RESEARCH, PUBLIC INFORMATION

SEC. 14. To promote the development of effective State and local noise control programs, to provide an adequate Federal noise control research program designed to meet the objectives of this Act, and to otherwise carry out the policy of this Act, the Administrator shall, in cooperation with other Federal agencies and through the use of grants, contracts, and direct Federal actions—

- (a) develop and disseminate information and educational materials to all segments of the public on the public health and other effects of noise and the most effective means for noise control, through the use of materials for school curricula, volunteer organizations, radio and television programs, publication, and other means;

(2) against—

(A) the Administrator of the Environmental Protection Agency where there is alleged a failure of such Administrator to perform any act or duty under this Act which is not discretionary with such Administrator, or

(B) the Administrator of the Federal Aviation Administration where there is alleged a failure of such Administrator to perform any act or duty under section 611 of the Federal Aviation Act of 1958 which is not discretionary with such Administrator.

The district courts of the United States shall have jurisdiction, without regard to the amount in controversy, to restrain such person from violating such noise control requirement or to order such Administrator to perform such act or duty, as the case may be.

(b) No action may be commenced—

- (1) under subsection (a)(1)—

(A) prior to sixty days after the plaintiff has given notice of the violation (i) to the Administrator of the Environmental Protection Agency (and to the Federal Aviation Administrator in the case of a violation of a noise control requirement under such section 611) and (ii) to any alleged violator of such requirement, or

(B) if an Administrator has commenced and is diligently prosecuting a civil action to require compliance with the noise control requirement, but in any such action in a court of the United States any person may intervene as a matter of right, or

(2) under subsection (a)(2) prior to sixty days after the plaintiff has given notice to the defendant that he will commence such action.

Notice under this subsection shall be given in such manner as the Administrator of the Environmental Protection Agency shall prescribe by regulation.

(c) In an action under this section, the Administrator of the Environmental Protection Agency, if not a party, may intervene as a matter of right. In an action under this section respecting a noise control requirement under section 611 of the Federal Aviation Act of 1958, the Administrator of the Federal Aviation Administration, if not a party, may also intervene as a matter of right.

(d) The court, in issuing any final order in any action brought pursuant to subsection (a) of this section, may award costs of litigation (including reasonable attorney and expert witness fees) to any party, whenever the court determines such an award is appropriate.

(e) Nothing in this section shall restrict any right which any person (or class of persons) may have under any statute or common law to seek enforcement of any noise control requirement or to seek any other relief (including relief against an Administrator).

(f) For purposes of this section, the term "noise control requirement" means paragraph (1), (2), (3), (4), or (5) of section 10(a), or a standard, rule, or regulation issued under section 17 or 18 of this Act or under section 611 of the Federal Aviation Act of 1958.

[42 U.S.C. 4911]

(b) conduct or finance research directly or with any public or private organization or any person on the effects, measurement, and control of noise, including but not limited to—

(1) investigation of the psychological and physiological effects of noise on humans and the effects of noise on domestic animals, wildlife, and property, and the determination of dose/response relationships suitable for use in decisionmaking, with special emphasis on the nonauditory effects of noise;

(2) investigation, development, and demonstration of noise control technology for products subject to possible regulation under sections 6, 7, and 8 of this Act;

(3) investigation, development, and demonstration of monitoring equipment and other technology especially suited for use by State and local noise control programs;

(4) investigation of the economic impact of noise on property and human activities; and

(5) investigation and demonstration of the use of economic incentives (including emission charges) in the control of noise;

(c) administer a nationwide Quiet Communities Program which shall include, but not be limited to—

(1) grants to States, local governments, and authorized regional planning agencies for the purpose of—  
(A) identifying and determining the nature and extent of the noise problem within the subject jurisdiction;

(B) planning, developing, and establishing a noise control capacity in such jurisdiction, including purchasing initial equipment;

(C) developing abatement plans for areas around major transportation facilities (including airports, highways, and rail yards) and other major stationary sources of noise, and, where appropriate, for the facility or source itself; and

(D) evaluating techniques for controlling noise (including institutional arrangements) and demonstrating the best available techniques in such jurisdiction;

(2) purchase of monitoring and other equipment for loan to State and local noise control programs to meet special needs or assist in the beginning implementation of a noise control program or project;

(3) development and implementation of a quality assurance program for equipment and monitoring procedures of State and local noise control programs to help communities assure that their data collection activities are accurate;

(4) conduct of studies and demonstrations to determine the resource and personnel needs of States and local governments required for the establishment and implementation of effective noise abatement and control programs; and

(5) development of educational and training materials and programs, including national and regional workshops,

to support State and local noise abatement and control programs;

except that no actions, plans or programs hereunder shall be inconsistent with existing Federal authority under this Act to regulate sources of noise in interstate commerce;

(d) develop and implement a national noise environmental assessment program to identify trends in noise exposure and response, ambient levels, and compliance data and to determine otherwise the effectiveness of noise abatement actions through the collection of physical, social, and human response data;

(e) establish regional technical assistance centers which use the capabilities of university and private organizations to assist State and local noise control programs;

(f) provide technical assistance to State and local governments to facilitate their development and enforcement of noise control, including direct onsite assistance of agency or other personnel with technical expertise, and preparation of model State or local legislation for noise control; and

(g) provide for the maximum use in programs assisted under this section of senior citizens and persons eligible for participation in programs under the Older Americans Act.

[42 U.S.C. 4913]

#### DEVELOPMENT OF LOW-NOISE-EMISSION PRODUCTS

SEC. 15. (a) For the purpose of this section:

(1) The term "Committee" means the Low-Noise-Emission Product Advisory Committee.

(2) The term "Federal Government" includes the legislative, executive, and judicial branches of the Government of the United States, and the government of the District of Columbia.

(3) The term "low-noise-emission product" means any product which emits noise in amounts significantly below the levels specified in noise emission standards under regulations applicable under section 6 at the time of procurement to that type of product.

(4) The term "retail price" means (A) the maximum statutory price applicable to any type of product; or (B) in any case where there is no applicable maximum statutory price, the most recent procurement price paid for any type of product.

(b)(1) The Administrator shall determine which products qualify as low-noise-emission products in accordance with the provisions of this section.

(2) The Administrator shall certify any product—

(A) for which a certification application has been filed in accordance with paragraph (5)(A) of this subsection;

(B) which is a low-noise-emission product as determined by the Administrator; and

(C) which he determines is suitable for use as a substitute for a type of product at that time in use by agencies of the Federal Government.

(3) The Administrator may establish a Low-Noise-Emission Product Advisory Committee to assist him in determining which



products qualify as low-noise-emission products for purposes of this section. The Committee shall include the Administrator or his designee, a representative of the National Bureau of Standards, and representatives of such other Federal agencies and private individuals as the Administrator may deem necessary from time to time. Any member of the Committee not employed on a full-time basis by the United States may receive the daily equivalent of the annual rate of basic pay in effect for grade GS-18 of the General Schedule for each day such member is engaged upon work of the Committee. Each member of the Committee shall be reimbursed for travel expenses, including per diem in lieu of subsistence as authorized by section 5703 of title 5, United States Code, for persons in the Government service employed intermittently.

(4) Certification under this section shall be effective for a period of one year from the date of issuance.

(5)(A) Any person seeking to have a class or model of product certified under this section shall file a certification application in accordance with regulations prescribed by the Administrator.

(B) The Administrator shall publish in the Federal Register a notice of each application received.

(C) The Administrator shall make determinations for the purposes of this section in accordance with procedures prescribed by him by regulation.

(D) The Administrator shall conduct whatever investigation is necessary, including actual inspection of the product at a place designated in regulations prescribed under subparagraph (A).

(E) The Administrator shall receive and evaluate written comments and documents from interested persons in support of, or in opposition to, certification of the class or model of product under consideration.

(F) Within ninety days after the receipt of a properly filed certification application the Administrator shall determine whether such product is a low-noise-emission product for purposes of this section. If the Administrator determines that such product is a low-noise-emission product, then within one hundred and eighty days of such determination the Administrator shall reach a decision as to whether such product is a suitable substitute for any class or classes of products presently being purchased by the Federal Government for use by its agencies.

(G) Immediately upon making any determination or decision under subparagraph (F), the Administrator shall publish in the Federal Register notice of such determination or decision, including reasons therefor.

(c)(1) Certified low-noise-emission products shall be acquired by purchase or lease by the Federal Government for use by the Federal Government in lieu of other products if the Administrator of General Services determines that such certified products have procurement costs which are no more than 125 per centum of the retail price of the least expensive type of product for which they are certified substitutes.

(2) Data relied upon by the Administrator in determining that a product is a certified low-noise-emission product shall be incorporated in any contract for the procurement of such product.

(d) The procuring agency shall be required to purchase available certified low-noise-emission products which are eligible for purchase to the extent they are available before purchasing any other products for which any low-noise-emission product is a certified substitute. In making purchasing selections between competing eligible certified low-noise-emission products, the procuring agency shall give priority to any class or model which does not require extensive periodic maintenance to retain its low-noise-emission qualities or which does not involve operating costs significantly in excess of those products for which it is a certified substitute.

(e) For the purpose of procuring certified low-noise-emission products any statutory price limitations shall be waived.

(f) The Administrator shall, from time to time as he deems appropriate, test the emissions of noise from certified low-noise-emission products purchased by the Federal Government. If at any time he finds that the noise-emission levels exceed the levels on which certification under this section was based, the Administrator shall give the supplier of such product written notice of this finding, issue public notice of it, and give the supplier an opportunity to make necessary repairs, adjustments, or replacements. If no such repairs, adjustments, or replacements are made within a period to be set by the Administrator, he may order the supplier to show cause why the product involved should be eligible for recertification.

(g) There are authorized to be appropriated for paying additional amounts for products pursuant to, and for carrying out the provisions of this section, \$1,000,000 for the fiscal year ending June 30, 1973, and \$2,000,000 for each of the two succeeding fiscal years, \$2,200,000 for the fiscal year ending June 30, 1976, \$550,000 for the transition period of July 1, 1976, through September 30, 1976, and \$2,420,000 for the fiscal year ending September 30, 1977.

(h) The Administrator shall promulgate the procedures required to implement this section within one hundred and eighty days after the date of enactment of this Act.

[42 U.S.C. 4914]

#### JUDICIAL REVIEW; WITNESSES

SEC. 16. (a) A petition for review of action of the Administrator of the Environmental Protection Agency in promulgating any standard or regulation under section 6, 17, or 18 of this Act or any labeling regulation under section 8 of this Act may be filed only in the United States Court of Appeals for the District of Columbia Circuit, and a petition for review of action of the Administrator of the Federal Aviation Administration in promulgating any standard or regulation under section 611 of the Federal Aviation Act of 1958 may be filed only in such court. Any such petition shall be filed within ninety days from the date of such promulgation, or after such date if such petition is based solely on grounds arising after such ninetieth day. Action of either Administrator with respect to which review could have been obtained under this subsection shall

not be subject to judicial review in civil or criminal proceedings for enforcement.

(b) If a party seeking review under this Act applies to the court for leave to adduce additional evidence, and shows to the satisfaction of the court that the information is material and was not available at the time of the proceeding before the Administrator of such Agency or Administration (as the case may be), the court may order such additional evidence (and evidence in rebuttal thereof) to be taken before such Administrator, and to be adduced upon the hearing, in such manner and upon such terms and conditions as the court may deem proper. Such Administrator may modify his findings as to the facts, or make new findings, by reason of the additional evidence so taken, and he shall file with the court such modified or new findings, and his recommendation, if any, for the modification or setting aside of his original order, with the return of such additional evidence.

(c) With respect to relief pending review of an action by either Administrator, no stay of an agency action may be granted unless the reviewing court determines that the party seeking such stay is (1) likely to prevail on the merits in the review proceeding and (2) will suffer irreparable harm pending such proceeding.

(d) For the purpose of obtaining information to carry out this Act, the Administrator of the Environmental Protection Agency may issue subpoenas for the attendance and testimony of witnesses and the production of relevant papers, books, and documents, and he may administer oaths. Witnesses summoned shall be paid the same fees and mileage that are paid witnesses in the courts of the United States. In cases of contumacy or refusal to obey a subpoena served upon any person under this subsection, the district court of the United States for any district in which such person is found or resides or transacts business, upon application by the United States and after notice to such person, shall have jurisdiction to issue an order requiring such person to appear and give testimony before the Administrator, to appear and produce papers, books, and documents before the Administrator, or both, and any failure to obey such order of the court may be punished by such court as a contempt thereof.

[42 U.S.C. 4915]

#### RAILROAD NOISE EMISSION STANDARDS

SEC. 17. (a)(1) Within nine months after the date of enactment of this Act, the Administrator shall publish proposed noise emission regulations for surface carriers engaged in interstate commerce by railroad. Such proposed regulations shall include noise emission standards setting such limits on noise emissions resulting from operation of the equipment and facilities of surface carriers engaged in interstate commerce by railroad which reflect the degree of noise reduction achievable through the application of the best available technology, taking into account the cost of compliance. These regulations shall be in addition to any regulations that may be proposed under section 6 of this Act.

(2) Within ninety days after the publication of such regulations as may be proposed under paragraph (1) of this subsection, and

subject to the provisions of section 16 of this Act, the Administrator shall promulgate final regulations. Such regulations may be revised, from time to time, in accordance with this subsection.

(3) Any standard or regulation, or revision thereof, proposed under this subsection shall be promulgated only after consultation with the Secretary of Transportation in order to assure appropriate consideration for safety and technological availability.

(4) Any regulation or revision thereof promulgated under this subsection shall take effect after such period as the Administrator finds necessary, after consultation with the Secretary of Transportation, to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period.

(b) The Secretary of Transportation, after consultation with the Administrator, shall promulgate regulations to insure compliance with all standards promulgated by the Administrator under this section. The Secretary of Transportation shall carry out such regulations through the use of his powers and duties of enforcement and inspection authorized by the Safety Appliance Acts, the Interstate Commerce Act, and the Department of Transportation Act. Regulations promulgated under this section shall be subject to the provisions of sections 10, 11, 12, and 16 of this Act.

(c)(1) Subject to paragraph (2) but notwithstanding any other provision of this Act, after the effective date of a regulation under this section applicable to noise emissions resulting from the operation of any equipment or facility of a surface carrier engaged in interstate commerce by railroad, no State or political subdivision thereof may adopt or enforce any standard applicable to noise emissions resulting from the operation of the same equipment or facility of such carrier unless such standard is identical to a standard applicable to noise emissions resulting from such operation prescribed by any regulation under this section.

(2) Nothing in this section shall diminish or enhance the rights of any State or political subdivision thereof to establish and enforce standards or controls on levels of environmental noise, or to control, license, regulate, or restrict the use, operation, or movement of any product if the Administrator, after consultation with the Secretary of Transportation, determines that such standard, control, license, regulation, or restriction is necessitated by special local conditions and is not in conflict with regulations promulgated under this section.

(d) The terms "carrier" and "railroad" as used in this section shall have the same meaning as such terms have under the first section of the Act of February 17, 1911 (45 U.S.C. 22). [42 U.S.C. 4916]

#### MOTOR CARRIER NOISE EMISSION STANDARDS

SEC. 18. (a)(1) Within nine months after the date of enactment of this Act, the Administrator shall publish proposed noise emission regulations for motor carriers engaged in interstate commerce. Such proposed regulations shall include noise emission standards setting such limits on noise emissions resulting from operation of motor carriers engaged in interstate commerce which reflect the de-

gree of noise reduction achievable through the application of the best available technology, taking into account the cost of compliance. These regulations shall be in addition to any regulations that may be proposed under section 6 of this Act.

(2) Within ninety days after the publication of such regulations as may be proposed under paragraph (1) of this subsection, and subject to the provisions of section 16 of this Act, the Administrator shall promulgate final regulations. Such regulations may be revised from time to time, in accordance with this subsection.

(3) Any standard or regulation, or revision thereof, proposed under this subsection shall be promulgated only after consultation with the Secretary of Transportation in order to assure appropriate consideration for safety and technological availability.

(4) Any regulation or revision thereof promulgated under this subsection shall take effect after such period as the Administrator finds necessary, after consultation with the Secretary of Transportation, to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period.

(b) The Secretary of Transportation, after consultation with the Administrator shall promulgate regulations to insure compliance with all standards promulgated by the Administrator under this section. The Secretary of Transportation shall carry out such regulations through the use of his powers and duties of enforcement and inspection authorized by the Interstate Commerce Act and the Department of Transportation Act. Regulations promulgated under this section shall be subject to the provisions of sections 10, 11, 12, and 16 of this Act.

(c)(1) Subject to paragraph (2) of this subsection but notwithstanding any other provision of this Act, after the effective date of a regulation under this section applicable to noise emissions resulting from the operation of any motor carrier engaged in interstate commerce, no State or political subdivision thereof may adopt or enforce any standard applicable to the same operation of such motor carrier, unless such standard is identical to a standard applicable to noise emissions resulting from such operation prescribed by any regulation under this section.

(2) Nothing in this section shall diminish or enhance the rights of any State or political subdivision thereof to establish and enforce standards or controls on levels of environmental noise, or to control, license, regulate, or restrict the use, operation, or movement of any product if the Administrator, after consultation with the Secretary of Transportation, determines that such standard, control, license, regulation, or restriction is necessitated by special local conditions and is not in conflict with regulations promulgated under this section.

(d) For purposes of this section, the term "motor carrier" includes a common carrier by motor vehicle, a contract carrier by motor vehicle, and a private carrier of property by motor vehicle as those terms are defined by paragraphs (14), (15), and (17) of section 203(a) of the Interstate Commerce Act (49 U.S.C. 303(a)).

[42 U.S.C. 4917]

AUTHORIZATION OF APPROPRIATIONS

Sec. 19. There are authorized to be appropriated to carry out this Act (other than for research and development) \$15,000,000 for the fiscal year ending September 30, 1979.

[42 U.S.C. 4918]

# The Environmental Protection Agency's Model Community Noise Control Ordinance

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**ARTICLE I Short Title**

This ordinance may be cited as the "Noise Control Ordinance of the (City/County) of \_\_\_\_\_"

**ARTICLE II Declarations of Findings and Policy & Scope**

- 2.1 Declaration of Findings and Policy**  
WHEREAS excessive sound and vibration are a serious hazard to the public health and welfare, safety, and the quality of life: and WHEREAS a substantial body of science and technology exists by which excessive sound and vibration may be substantially abated: and, WHEREAS the people have a right to and should be ensured an environment free from excessive sound and vibration that may jeopardize their health or welfare or safely or degrade the quality of life: and NOW, THEREFORE, it is the policy of the (City/County) of \_\_\_\_\_ to prevent excessive sound and vibration which may jeopardize the health and welfare or safety of its citizens or degrade the quality of life.
- 2.2 Scope**  
This ordinance shall apply to the control of all sound and vibration originating within the limits of the (City/County) of \_\_\_\_\_

**ARTICLE III Definitions**

- 3.1 Terminology**  
All terminology used in this ordinance not defined below, shall be in conformance with applicable publications of the American National Standards institute (ANSI) or its successor body.
- 3.2.1 "A-Weighted Sound Level" Means**  
The sound pressure level in decibels as measured on a sound level meter using the A-weighting network. The level so read is designated dB(A) or dBA.
- 3.2.2 "Commercial Area" Means**  
[(As defined in the community (comprehensive plan)/ (zoning ordinance)].
- 3.2.3 "Construction" Means**  
Any site preparation, assembly, erection, substantial repair, alteration, or similar action, but excluding demolition, for or of public or private rights-of-way, structures, utilities or similar property.
- 3.2.4 "Day-Night Average Sound Level (L<sub>dn</sub>)" Means**  
The 24-hour energy average of the A-weighted sound pressure level, with the levels during the period 10:00 p.m. to 7:00 a.m. the following day increased by 10 dBA before averaging.
- 3.2.5 "Decibel (dB)" Means**  
A unit for measuring the volume of a sound, equal to 20 times (the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 microneutons per square meter).
- 3.2.6 "Demolition" Means**  
Any dismantling, intentional destruction or removal of structures, utilities, public or private right-of-way surfaces, or similar property.
- 3.2.7 "Emergency" Means**  
Any occurrence or set or circumstances involving actual or imminent physical trauma or property damage which demands immediate action.
- 3.2.8 "Emergency Work" Means**  
Any work performed for the purpose of preventing or alleviating the physical trauma or property damage threatened or caused by an emergency.
- 3.2.9 " Noise Control Officer" Means**  
The municipal agency or department having lead responsibility for this ordinance. (If no such agency is designated, the term shall mean the municipal official having lead responsibility for this ordinance.)
- 3.2.10 "Equivalent A-Weighted Sound Level (L<sub>eq</sub>)" Means**  
The constant sound level that in a given situation and time period, conveys the same sound energy as the actual time-varying A-weighted sound. [For the purposes of this ordinance, a time period of 24

hours shall be used, unless otherwise specified.]

**3.2.11 "Gross Vehicle Weight Rating (GVWR) Means**  
The value specified by the manufacturer as the recommended maximum loaded weight of a single motor vehicle. In cases where trailers and tractors are separable, the gross combination weight rating (GCWH), which is the value specified by the manufacturer as the recommended maximum loaded weight of the combination vehicle shall be used.

**3.2.12 "Impulsive Sound" Means**  
Sound of short duration, usually less than one second, with an abrupt onset and rapid decay. Examples of sources of impulsive sound include explosions, drop forge impacts, and the discharge of firearms.

**3.2.13 "Industrial Area" Means**  
[(As defined in the community (comprehensive plan)/ (zoning ordinance)].

**3.2.14 "Motor Carrier Vehicle Engaged in Interstate Commerce" Means**  
Any \*\*\*\* for which regulations \*\*\*\* pursuant to Section 18 of the Federal Noise Control Act of 1972(P.L. 72-\*\*\*), as amended, pertaining to motor carriers engaged in interstate commerce.

**3.2.15 "Motor Vehicle" Means**  
As defined in the motor vehicle code of this state. [Any vehicle which is propelled or drawn on land by a motor, such is, but not limited to, passenger cars, trucks, truck-trailers, semi-trailers, campers, go-carts, amphibious craft on land, \*\*\*\* \*\*, or racing vehicles, but \*\*\*\* \*\* motorcycles.]

**3.2.16 "Motorboat" Means**  
Any vessel which operates on water and \*\*\*\* is propelled by a motor, including but not limited to, boats, barges, amphibious craft, water ski \*\*\*\* devices and hover craft.

**3.2.17 "Motorcycle" Means**  
As defined in the motor vehicle code of this state. [An unenclosed motor vehicle having a saddle for the use of the operator and two or three wheels in contact with the ground, including but not limited to, motor scooters and mini-bikes.]

**3.2.18 "Muffler or Sound Dissipative Device" Means**  
A device for abating sound of escaping gases of an internal combustion engine.

**3.2.19 "Noise" Means**  
Any sound which annoys or disturbs humans or which causes or tends to cause an adverse psychological or physiological effect on humans.

**3.2.20 "Noise Disturbance" Means**  
Any sound which (a) endangers or \*\*\*\* the safety or health of humans or animals; or (b) annoys or disturbs a reasonable person of normal sensitivities; or (c) endangers or injures personal or real property.

**3.2.21 "Noise Sensitive Zone" Means**  
Any area designated pursuant to Section \*\*\*\* of this ordinance for the purpose of ensuring exceptional quiet.

**3.2.22 "Person" Means**  
Any individual, association, partnership, or corporation, and includes any officer, employee, department, agency or instrumentality of a State or any political subdivision of a State.

**3.2.23 "Powered Model Vehicle" Means**  
Any self-propelled airborne, waterborne, or land borne plane, vessel, or vehicle, which is not designed to carry persons, including, but not limited to any model airplane, boat, car, or rocket.

**3.2.24 "Public Right-of-Way" Means**  
Any street, avenue, boulevard, highway, sidewalk or alley or similar place which is owned or controlled by a governmental entity.

**3.2.25 "Public Space" Means**  
Any real property or structures thereon which are owned or controlled by a governmental entity.

**3.2.26 "Pure Tone" Means**  
Any sound which can be distinctly heard as a single pitch or a set of single pitches. For the purposes of this ordinance, a pure tone shall exist if the one-third octave band sound pressure level in the band with the tone exceeds the arithmetic average of the sound pressure levels of the two contiguous one-third octave bands by 5 dB for center frequencies of 500 Hz and above and by 8 dB for center frequencies between 160 and 400 Hz and by 15 dB for center frequencies less than or equal to 125 Hz.

**3.2.27 "Real Property Boundary" Means**  
An imaginary line along the ground surface, and its vertical extension, which separates the real property owned by one person from that owned by another person, but not including intra-building real property divisions.

**3.2.28 "Residential Area" Means**  
[(As defined in the community (comprehensive plan)/ (zoning ordinance)].

**3.2.29 "RMS Sound Pressure" Means**  
The square root of the time averaged square of the sound pressure, denoted  $P_{rms}$ .

**3.2.30 "Sound" Means**  
An oscillation in pressure, particle displacement, particle velocity or other physical parameter, in a medium with internal forces that causes compression and rarefaction of that medium. The description of sound may include any characteristic of such sound, including duration, intensity and frequency.

**3.2.31 "Sound Level" Means**  
The weighted sound pressure level obtained by the use of a sound level meter and frequency-weighting

network, such as A or C, as specified in the American National Standards Institute specifications for sound level meters (ANSI S1.4-1971), or the latest approved revision thereof. If the frequency weighting employed is not indicated, the A-weighting shall apply.

**3.2.32 "Sound Level Meter" Means**

An instrument which includes a microphone, amplifier, RMS detector, integrator or time averaging device, output meter, and weighting networks used to measure sound pressure levels.

**3.2.33 "Sound Pressure" Means**

The instantaneous difference between the actual pressure and the average or barometric pressure of a given point in space, as produced by sound energy.

**3.2.34 "Sound Pressure Level" Means**

20 times the logarithm to the base 10 of the ratio of the RMS sound pressure to the reference pressure of 20 micropascals ( $20 \times 10 \mu\text{N/m}$ ). The sound pressure level is denoted  $L_p$ , or SPL and is expressed in decibels.

**3.2.35 "Vibration" Means**

An oscillatory motion of solid bodies of deterministic or random nature described by displacement, velocity, or acceleration with respect to a given reference point.

**3.2.36 "Weekday" Means**

Any day Monday through Friday which is not a legal holiday.

**ARTICLE IV Powers and Duties of the Noise Control Officer (NCO)**

**4.1 Lead (Agency/Official)**

The noise control program established by this ordinance shall be administered by (title of municipal agency or lead official).

**4.2 Powers of the Noise Control Officer (NCO)**

In order to implement and enforce this ordinance and for the general purpose of sound and vibration abatement and control, the NCO shall have, in addition to any other authority vested in it, the power to:

**4.2.1 Studies**

Conduct, or cause to be conducted, research, monitoring, and other studies related to sound and vibration.

**4.2.2 Education**

(a) Conduct programs of public education regarding:  
(1) the causes, effects and general methods of abatement and control of noise and vibration; and,  
(2) the actions prohibited by this ordinance and the procedures for reporting violations; and  
(b) encourage the participation of public interest groups in related public information efforts.

**4.2.3 Coordination and Cooperation**

(a) Coordinate the noise and vibration control activities of all municipal departments;  
(b) Cooperate to the extent practicable with all appropriate State and Federal agencies;  
(c) Cooperate or combine to the extent practicable with appropriate county and municipal agencies; and,  
(d) Enter into contracts [with the approval of the (appropriate authority)] for the provision of technical and enforcement services.

**4.2.4 Review of Actions of Other Departments**

Request any other department or agency responsible for any proposed or final standard, regulation or similar action to consult on the advisability of revising the action, if there is reason to believe that the action is not consistent with this ordinance.

**4.2.5 Review of Public and Private Projects**

Review public and private projects, subject to mandatory review or approval by other departments, for compliance with this ordinance, if such projects are likely to cause sound or vibration in violation of this ordinance.

**4.2.6 Inspections**

(a) Upon presentation of proper credentials, enter and inspect any private property or place, and inspect any report or records at any reasonable time when granted permission by the owner, or by some other person with apparent authority to act for the owner. When permission is refused or cannot be obtained, a search warrant may be obtained from a court of competent jurisdiction upon showing of probable cause to believe that a violation of this ordinance may exist. Such inspection may include administration of any necessary tests.  
(b) Stop any motor vehicle, motorcycle, or motorboat operated on a public right-of-way, public space, or public waterway reasonably suspected of violating any provision of this ordinance, and issue a notice of violation or abatement order which may require the motor vehicle, motorcycle or motorboat to be inspected or tested as the Noise Control Officer may reasonably require.]

**4.2.7 Records**

Require the owner or operator of any commercial or industrial activity to establish and maintain records and make such reports as the NCO may reasonably prescribe.

**4.2.8 Measurements by the Owner or Operator**

Require the owner or operator of any commercial or industrial activity to measure the sound level of or the vibration from any source in accordance with the [published] methods and procedures and at such locations and times as the NCO may reasonably prescribe and to furnish reports of the results of such measurements to the NCO. The NCO may require the measurements to be conducted in the presence of its enforcement officials.

- 4.2.9 Product Performance Standard Recommendations**  
 (a) Develop and recommend for promulgation (to the appropriate authority) provisions regulating the use and operation of any product, including the specification of maximum allowable sound emission levels of such product.  
 ((b) Develop and recommend for promulgation (to the appropriate authority) provisions prohibiting the sale of products which do not meet specified sound emission levels, where the sound level of the product is not regulated by the United States Environmental Protection Agency under Section 6 of the Noise Control Act of 1972.]
- 4.2.10 Noise Sensitive Zone Recommendations**  
 Prepare recommendations, to be approved by (the appropriate authority), for the designation of noise sensitive zones which contain noise sensitive activities. Existing quiet zones shall be considered noise sensitive zones until otherwise designated. Noise sensitive activities include, but are not limited to, operations of schools, libraries open to the public, churches, hospitals, and nursing homes.
- 4.3 Duties of Noise Control Officer (NCO)**  
 In order to implement and enforce this ordinance effectively, the NCO shall within a reasonable time after the effective date of the ordinance:
- 4.3.1 Standards, Testing Methods, and Procedures**  
 Develop, [recommend to the appropriate authority.] and promulgate standards, testing methods and procedures.
- 4.3.2 Investigate and Pursue Violations**  
 In consonance with Section 4.2.6, Article XI, and other provisions of this ordinance, investigate and pursue possible violations of this ordinance.
- 4.3.3 Delegation of Authority**  
 Delegate functions, where appropriate under this ordinance, to personnel within the NCO and to other agencies or departments, (subject to approval of .....).
- 4.3.4 Truck Routes and Transportation Planning**  
 (a) Study the existing transportation systems, such as truck routes within the community; determine areas with sensitivity to sound and vibration caused by transportation; recommend changes or modifications to transportation systems to minimize the sound and vibration impact on residential areas and noise sensitive zones  
 (b) Assist in or review the total transportation planning of the community, including planning for new roads and highways, bus routes, airports, and other systems for public transportation, to ensure that the impact of sound and vibration receives adequate consideration.
- 4.3.5 Capital Improvement Guidelines**  
 Establish noise assessment guidelines for the evaluation of proposed improvements for the capital improvements budget and program pursuant to Section 5.5. These guidelines shall assist in the

determination of the relative priority of each improvement in terms of noise impact.

- 4.3.6 State and Federal Laws and Regulations**  
 (a) Prepare and publish [with the approval of .....] a list of those products manufactured to meet specified noise emission limits under Federal, State, or community law for which "tampering" enforcement will be conducted; and.  
 (b) Make recommendations for modifications or amendments to this ordinance to ensure consistency with all State and Federal law; and regulations.
- 4.3.7 Planning to Achieve Long Term Noise Goals**  
 [Develop a generalized sound level map of the (city/county), a long term plan for achieving quiet in the (city/county), and [with the approval of .....] integrate this plan into the planning process of the (city/county).]
- 4.3.8 Administer Grants, Funds and Gifts**  
 Administer noise program grants and other funds and gifts from public and private sources, including the State and Federal governments.
- 4.3.9 Periodic Report**  
 [Evaluate and report, every ..... year(s) following the effective date of this ordinance, on the effectiveness of the (city/county) noise control program and make recommendations for any legislative or budgetary changes necessary to improve the program. This report shall be made to the (Noise Control Advisory Board)/ (appropriate authority) which may amend it after consultation with the NCO, and then submit it to the (appropriate authority), for approval.]

**ARTICLE V Duties and Responsibilities of Other Departments**

- 5.1 Departmental Actions**  
 All departments and agencies shall, to the fullest extent consistent with other law, carry out their programs in such a manner as to further the policy of this ordinance.
- 5.2 Departmental Cooperation**  
 All departments and agencies shall cooperate with the NCO to the fullest extent in enforcing this ordinance.
- 5.3 Departmental Compliance with Other Laws**  
 All departments and agencies shall comply with Federal and State laws and regulations and the provisions and intent of this ordinance respecting the control and abatement of noise to the same extent that any person is subject to such laws and regulations.
- 5.4 Project Approval**  
 All departments whose duty it is to review and approve new projects or changes to existing projects that result, or may result, in the production of sound or vibration shall consult with the NCO prior to any such approval.



**5.5 Contracts**  
Any written contract, agreement, purchase order, or other instrument whereby the (city/county) a committed to the expenditure of ..... dollars or more in return for goods or services shall contain provisions requiring compliance with this ordinance.

**5.6 Low Noise Emission Products**  
Any product which has been certified by the Administrator of the United States Environmental Protection Agency pursuant to Section 15 of the Noise Control Act as a low noise emission product and which he determines is suitable for use as a substitute, shall be procured by the city/county and used in preference to any other product, provided that such certified product is reasonably available and has a procurement cost which is not more than (125) percent of the least expensive type of product for which it is certified as a substitute.

**5.7 Capital Improvement Program**  
All departments responsible for a capital improvements budget and program shall prepare an analysis of the noise impact of any proposed improvements in accordance with noise assessment guidelines established by the NCO pursuant to Section 4.3.5. Proposed capital improvements include land acquisition, building construction, highway improvements, and utilities and fixed equipment installation.

## ARTICLE VI Prohibited Acts

**6.1 Noise Disturbances Prohibited**  
No person shall unreasonably make, continue, or cause to be made, or continued, any noise disturbance. Non-commercial public speaking and public assembly activities conducted on any public space or public right-of-way shall be exempt from the operation of this Section.

**6.2 Specific Prohibitions**  
The following acts, and the causing thereof, are declared to be in violation of this ordinance:

**6.2.1 Radios, Television Sets, Musical Instruments and, Similar Devices**  
Operating, playing or permitting the operation or playing of any radio, television, phonograph, drum, musical instrument, sound amplifier, or similar device which produces, reproduces, or amplifies sound:  
(a) Between the hours of .....p.m. and ..... a.m. the following day in such a manner as to create a noise disturbance across a real property boundary or within a noise sensitive zone. [Except for activities open to the public and for which a permit has been issued by (appropriate authority) according to criteria set forth in .....];  
(b) In such a manner as to create a noise disturbance at 50 feet (15 meters) from such device, when operated in or on a motor vehicle on a public right-of-way or public space, or in a boat on public

waters, or;  
(c) In such a manner as to create a noise disturbance to any person other than the operator of the device, when operated by any passenger on a common carrier;  
(d) This section shall not apply to non-commercial spoken language covered under Section 6.2.2.

**6.2.2 Loudspeakers/Public Address Systems**  
(a) Using or operating for any non-commercial purpose any loudspeaker public address system, or similar device between the hours of 10:00 p.m. and 8:00 a.m. the following day, such that the sound there from creates a noise disturbance across a residential real property boundary or within a noise sensitive zone.  
(b) Using or operating for any commercial purpose any loudspeaker, public address system, or similar device \*\*\*\* such that the sound there from creates a noise disturbance across a real property boundary or within a noise sensitive zone: or (2) between the hours of .... p.m. and ..... a.m. the following day on a public right-of-way or public space.

**6.2.3 Street Sales**  
Offering for sale or selling anything by shouting or outcry within any residential or commercial area of the \*\*\*\* county (except by permit issued by (appropriate authority) according to criteria set forth in .... and/or except between the hours of ... a.m. and .. p.m.].

**6.2.4 Animals and Birds**  
Owning possessing or harboring any animal or bird which frequently or for continued duration, howls, barks, \*\*\*\* squawks, or makes other sounds which create a noise disturbance across a residential real property boundary or within a noise sensitive zone. [This provision shall not apply to public zoos.]

**6.2.5 Loading and Unloading**  
Loading, unloading, opening, closing or other handling of boxes, crates, containers, building materials, garbage cans, or similar objects between the hours of ..... p.m. and ..... a.m. the following day in such a manner as to cause a noise disturbance across a residential real property boundary or within a noise sensitive zone.

**6.2.6 Construction**  
Operating or permitting the operation of any tools or equipment used in construction, drilling, or demolition work:  
(a) Between the hours of ..... p.m. and ..... a.m. the following day on weekdays or at any time on (Sundays/weekends) or holidays, such that the sound there from creates a noise disturbance across a residential real property boundary or within a noise sensitive zone, except for emergency work of public service utilities or by special variance issued pursuant to Section 7.2;  
(b) At any other time such that the sound level at or across a real property boundary exceeds an  $L_{eq}$  of ..... dBA for the daily period of operation.  
(c) This section shall not apply to the use of domestic power tools subject to Section 6.2.17.

- 6.2.7 Vehicle or Motorboat Repairs and Testing**  
Repairing, rebuilding, modifying, or testing any motor vehicle, motorcycle, or motorboat in such a manner as to cause a noise disturbance across a residential real property boundary or within a noise sensitive zone.
- 6.2.8 Airport and Aircraft Operations**  
**(a)** The NCO shall consult with the airport proprietor to recommend changes in airport operations to minimize any noise disturbance which the airport owner may have authority to control in its capacity as proprietor.  
**(b)** Nothing in this section shall be construed to prohibit, restrict, penalize, enjoin or in any manner regulate the movement of aircraft which are in all respects, conducted in accordance with, or pursuant to applicable Federal Laws or regulations.
- 6.2.9 Places of Public Entertainment**  
Operating, playing or permitting the operation or playing of any radio, television, phonograph, drum, musical instrument, sound amplifier, or similar device which produces, reproduces, or amplifies sound in any place of public entertainment at a sound level greater than ..... dBA as read by the slow response on a sound level meter at any point that is normally occupied by a customer, unless a conspicuous and legible sign is located outside such place, near each public entrance, slating "WARNING: SOUND LEVELS WITHIN MAY CAUSE PERMANENT HEARING IMPAIRMENT."
- 6.2.10 Explosives, Firearms, and Similar Devices**  
The use or firing of explosives, firearms, or similar devices which create impulsive sound so as to cause a noise disturbance across a real property boundary or on a public space or right-of-way, without first obtaining a special variance issued pursuant to Section 7.2. [Such permit need not be obtained for licensed game-hunting activities on property where such activities are authorized.]
- 6.2.11 Powered Model Vehicles**  
Operating or permitting the operation of powered model vehicles so as to create a noise disturbance across a residential real property boundary, in a public space or within a noise sensitive zone between the hours of ..... p.m. and ..... a.m. the following day. Maximum sound levels in a public space during the permitted period of operation shall conform to those set forth for residential land use in Table 1 of Section 8.1 and shall be measured at a distance of ..... feet (meters) from any point on the path of the vehicle. Maximum sound levels for residential property and noise sensitive zones, during the permitted period of operation, shall be governed by Section 8.1 and Section 6.2.16, respectively.
- 6.2.12 Vibration**  
Operating or permitting the operation of any device that creates vibration which is above the vibration perception threshold of an individual at or beyond

the property of the source if on private property or at ..... feet (meters) from the source if on a public space or public right-of-way. For the purposes of this section, "vibration perception threshold" means the minimum ground or structure-borne vibratory motion necessary to cause a normal person to be aware of the vibration by such direct means as, but not limited to sensation by touch or usual observation of moving objects.

- 6.2.13 Stationary Non-Emergency Signaling Devices**  
**(a)** Sounding or permitting the sounding of any [electronically-amplified] signal from any stationary bell, chime, siren, whistle, or similar device, intended primarily for non-emergency purposes, from any place, (for more than ..... minutes in any hourly period.)  
**[(b)]** Devices used in conjunction with places of religious worship shall be exempt from the operation of this provision.  
**[(c)]** Sound sources covered by this provision and not exempted under subsection (b) shall be exempted by (appropriate authority) using criteria set forth in Section 7.2.]
- 6.2.14 Emergency Signaling Devices**  
**(a)** The intentional sounding or permitting the sounding outdoors of any fire, burglar, or civil defense alarm, siren, whistle or similar stationary emergency signaling device, except for emergency purposes or for testing, as provided in Subsection (b).  
**(b)(i)** Testing of a stationary emergency signaling device shall occur at the same time of day each time such a test is performed, but not before ..... a.m. or after ..... p.m. Any such testing shall use only the minimum cycle test time. In no case shall such test time exceed ..... seconds.  
**(b)(ii)** Testing of the complete emergency signaling system, including the functioning of the signaling device and the personnel response to the signaling device, shall not occur more than once in each calendar month. Such testing shall not occur before ..... a.m. or after ..... p.m. The time limit specified in subsection (i) shall not apply to such complete system testing.  
**[(c)]** Sounding or permitting the sounding of any exterior burglar [or fire] alarm or any motor vehicle burglar alarm unless such alarm is automatically terminated within .... minutes of activation. [This action shall not be interpreted to apply to ..... alarms.]
- 6.2.15 Motorboats**  
Operating or permitting the operation of any motorboat in any lake, river, stream, or other waterway in such manner as to exceed a sound level of ..... dBA at 50 feet (15 meters) or the nearest shoreline, whichever distance is less.
- 6.2.16 Noise Sensitive Zones**  
**(a)** Creating or causing the creation of any sound within any noise sensitive zone designated pursuant to Section 4.2.10, so as to disrupt the activities normally conducted within the zone, provided that conspicuous signs are displayed indicating the

presence of the zone; or  
(b) Creating or causing the creation of any sound within any noise sensitive zone, designated pursuant to Section 4.2.10, containing a hospital, nursing home, or similar activity, so as to interfere with the functions of such activity or disturb or annoy the patients in the activity, provided that conspicuous signs are displayed indicating the presence of the zone.

**6.2.17 Domestic Power Tools**

Operating or permitting the operation of any mechanically powered saw, sander, drill, grinder, lawn or garden tool, snow blower, or similar device used outdoors in residential areas between the hours of ..... p.m. and ..... a.m. the following day so as to cause a noise disturbance across a residential real property boundary.

**6.2.18 Tampering**

The following acts or the causing thereof are prohibited:

(a) The removal or rendering inoperative by any person other than for purposes of maintenance, repair, or replacement, of any noise control device or element of design or noise label of any product identified under Section 4.3.6. The NCO may, by regulation, list those acts which constitute violation of this provision.

[(b) The (intentional) moving or rendering inaccurate or inoperative of any sound monitoring instrument or device positioned by or for the NCO, provided such device or the immediate area is clearly labeled, in accordance with NCO regulations, to warn of the potential illegality.]

(c) The use of a product, identified under Section 4.3.6, which has had a noise control device or element of design or noise label removed or rendered inoperative, with knowledge that such action has occurred.

**ARTICLE VII Exceptions and Variances**

**7.1 Emergency Exception**

The provisions of this ordinance shall not apply to;  
(a) the emission of sound for the purpose of alerting persons to the existence of an emergency, or  
(b) the emission of sound in the performance of emergency work

**7.2 Special Variances**

(a) The (NCO)/(Hearing Board) shall have the authority, consistent with this section, to grant special variances which may be requested pursuant to Sections 6.2.6 (Construction) and 6.2.10 (Explosives, Firearms, and Similar Devices).  
(b) Any person seeking a special variance pursuant to this section shall file an application with the (NCO)/(Hearing Board). The application shall contain information which demonstrates that bringing the source of sound or activity for which the special variance is sought into compliance with this ordinance would constitute an unreasonable hardship on the applicant, on the community, or on other persons. [Notice of an application for a special

variance shall be published according to (Jurisdictional procedure).] Any individual who claims to be adversely affected by allowance of the special variance may file a statement with the (NCO)/(Hearing Board) containing any information to support his claim. If the (NCO)/(Hearing Board) finds that a sufficient controversy exists regarding an application, a public hearing may be held.

(c) In determining whether to grant or deny the application, the (NCO)/(Hearing Board) shall balance the hardship to the applicant, the community, and other persons of not granting the special variance against the adverse impact on the health, safety, and welfare of persons affected, the adverse impact on property affected, and any other adverse impacts of granting the special variance. Applicants for special variances and persons contesting special variances may be required to submit any information the (NCO)/(Hearing board) may reasonably require. In granting or denying an application, the (NCO)/(Hearing Board) shall place on public file a copy of the decision and the reasons for denying or granting the special variance.

(d) Special variances shall be granted by notice to the applicant containing all necessary conditions, including a time limit on the permitted activity. The special variance shall not become effective until all conditions are agreed to by the applicant. Noncompliance with any condition of the special variance shall terminate it and subject the person holding it to those provisions of this ordinance regulating the source of sound or activity for which the special variance was granted, including enforcement actions.

(e) Application for extension of time limit specified in special variances or for modification of other substantial conditions shall be treated like applications for initial special variances under subsection (b).

(f) The (NCO)/(Hearing Board) may issue guidelines [approved by .....] defining the procedures to be followed in applying for a special variance and the criteria to be considered in deciding whether to grant a special variance.

**7.3 Variances for Time to Comply**

(a) Within ..... days following the effective date of this ordinance, the owner of any commercial or industrial source of sound may apply to the (NCO)/(Hearing Board) for a variance in time to comply with Section 6.2.12 (Vibration) or Article VIII. The (NCO)/(Hearing Board) shall have the authority, consistent with this section, to grant a variance, not to exceed ..... days from the effective date of this ordinance.

(b) Any person seeking a variance in time to comply shall file an application with the (NCO)/(Hearing Board). The application shall contain information which demonstrates that bringing the source of sound or activity for which the variance is sought into compliance with this ordinance prior to the date requested in the application would constitute an unreasonable hardship on the applicant, on the community, or on other persons. [Notice of an application for a variance in time to comply shall be published

according to (jurisdictional procedure).] Any individual who claims to be adversely affected by allowance of the variance in time to comply may file a statement with the (NCO)/(Hearing Board) containing any information to support their claim. If the (NCO)/(Hearing Board) finds that a sufficient controversy exists regarding an application, a public hearing may be held.

(c) In determining whether to grant or deny the application, the (NCO)/(Hearing Board) shall balance the hardship to the applicant, the community, and other persons of not granting the variance in time to comply, against the adverse impact on health, safety, and welfare of persons affected, the adverse impact on property affected, and any other adverse impacts of granting the variance. Applicants for variances in time to comply and persons contesting variances may be required to submit any information the (NCO)/(Hearing Board) may reasonably require. In granting or denying an application, the (NCO)/(Hearing Board) shall place on public file a copy of the decision and the reasons for denying or granting the variance in time to comply.

(d) Variances in time to comply shall be granted to the applicant containing all necessary conditions, including a schedule for achieving compliance. The variance in time to comply shall not become effective until all conditions are agreed to by the applicant. Noncompliance with any condition of the variance shall terminate the variance and subject the person holding it to those provisions of this ordinance for which the variance was granted.

(e) Application for extension of time limits specified in variances in time to comply or for modification of other substantial conditions shall be treated like applications for initial variances under subsection (b), except that the (NCO)/(Hearing Board) must find that the need for the extension or modification clearly outweighs any adverse impacts of granting the extension or modification.

(f) The (NCO)/(Hearing Board) may issue guidelines [approved by .....] defining the procedures to be followed in applying for a variance in time to comply and the criteria to be considered in deciding whether to grant a variance.

- 7.4 Appeals**  
 Appeals of an adverse decision of the (NCO)/(Hearing Board) shall be made to the (appropriate court of law). Review of the court shall be (de novo)/ (limited to whether the decision is supported by substantial evidence)/(as specified by the .....).

**ARTICLE VIII Sound Levels by Receiving Land Use**

- 8.1 Maximum Permissible Sound Levels**  
 No person shall operate or cause to be operated on private property any source of sound in such a manner as to create a sound level which exceeds the limits set forth for the receiving land use category in Table 1 when measured at or within the property boundary of the receiving land use.

**TABLE 1  
 SOUND LEVELS BY RECEIVING LAND USE**

Receiving Land Use Category	Time	Sound Level Limit (dBA)
R-1, R-2, etc.	(A) a.m. to (B) p.m.	$L_{eq}$
(Residential, Public Space, Open Space, Agricultural or Institutional)	(A) a.m. to (B) p.m.	$L_{eq}$
C-1, C-2, etc. B-1, B-2, etc. (Commercial or Business)	At All Times	$L_{eq}$
M-1, M-2, etc. (Industrial)	At All Times	$L_{eq}$

- 8.2 Correction for Character of Sound**  
 For any source of sound which emits a pure tone or impulsive sound, the maximum sound level limits set forth in Section 8.1 shall be reduced by ..... dBA.

- 8.3 Exemptions**  
 The provisions of this article shall not apply to:  
 (a) Activities covered by the following Sections: 6.2.6 (Construction), 6.2.8 (Aircraft and Airport Operations), 6.2.10 (Explosives, Firearms, and Similar Devices), 6.2.13 (Stationary Non-emergency Signaling Devices), 6.2.14 (Emergency Signaling Devices), 6.2.15 (Motorboats), 6.2.17 (Domestic Power Tools), 9.1.3 (Refuse Collection Vehicles), 9.2 (Recreational Motorized Vehicles Operating Off Public Rights-of-way);  
 (b) the un-amplified human voice;  
 (c) interstate railway locomotives and cars; and  
 (d) (non-stationary farming equipment)/(all agricultural activities)]

**ARTICLE IX Motor Vehicle Maximum Sound Levels**

- 9.1 Motor Vehicles and Motorcycles on Public Rights-of-way**  
 No person shall operate or cause to be operated a public or private motor vehicle or motorcycle on a public right-of-way at any time in such a manner that the sound level emitted by the motor vehicle or motorcycle exceeds the level set forth in Table 2.

**TABLE 2  
MOTOR VEHICLE AND  
MOTORCYCLE SOUND LIMITS  
(MEASURED AT 50 FEET OR 15 METERS)**

Vehicle Class	Sound Level Limit in dBA Speed Limit		
	35 mph or Less	Over 35 mph	Stationary Run-up
Motor Carrier Vehicle engaged in interstate commerce of GVWR or GCWR of 10,000 lbs or more	86	90	88
All other motor vehicles of GVWR or GCWR of 10,000 lbs or more	A	B	-
Any Motorcycle	C	D	-
Any other motor vehicle or any combination of vehicles towed by any motor vehicle	E	F	-

**9.1.1 Adequate Mufflers or Sound Dissipative Devices**

- (a) No person shall operate or cause to be operated any motor vehicle or motorcycle not equipped with a muffler or other sound dissipative device in good working order and in constant operation:
- (b) No person shall remove or render inoperative, or cause to be removed or rendered inoperative, other than for purposes of maintenance, repair, or replacement, any muffler or sound dissipative device on a motor vehicle or motorcycle;
- (c) The NCO may, by (guidelines) (regulations) subject to approval by ....., list those acts which constitute violation of this section.

**9.1.2 Motor Vehicle Horns and Signaling Devices**

- The following acts and the causing thereof are declared to be in violation of this ordinance:
- (a) The sounding of any horn or other auditory signaling device on or in any motor vehicle on any public right-of-way or public space, except (as a warning of danger)/(as provided in the vehicle code).
  - [(b) The sounding of any horn or other auditory signaling device which produces a sound level in excess of ..... dBA at ..... feet (meters).]

**9.1.3 Refuse Collection Vehicles**

- No person shall;
- (a) On or after (2 years) following the effective date of this ordinance, operate or permit the operation of the compacting mechanism of any motor vehicle which compacts refuse and which creates, during the compacting cycle, a sound level in excess of .. dBA when measured at ..... feet (meters) from any point on the vehicle: or
  - (b) Operate or permit the operation of the compacting mechanism of any motor vehicle which compacts refuse, between the hours of ..... p.m. and

..... a.m. the following day in a residential area or noise sensitive zone: or  
 (c) Collect refuse with a refuse collection vehicle between the hours of ..... p.m. and ..... a.m. the following day in a residential area or noise sensitive zone.

**9.1.4 Standing Motor Vehicles**

No person shall operate or permit the operation of any motor vehicle with a gross vehicle weight rating (GVWR) in excess of ten thousand (10,000) pounds, or any auxiliary equipment attached to such a vehicle, for a period longer than ..... minutes in any hour while the vehicle is stationary, for reasons other than traffic congestion, on a public right-of-way or public space within 150 feet (46 meters) of a residential area or designated noise sensitive zone. between the hours of ..... p.m. and ..... a.m. the following day.

**9.2 Recreation Motorized Vehicles Operating Off Public Rights-of-way**

- (a) [Except as permitted in subsection (b) or (c),] no person shall operate or cause to be operated any recreational motorized vehicle off a public right-of-way in such a manner that the sound level emitted there from exceeds the limits set forth in Table 3 at a distance of 50 feet (15 meters) or more from the path of the vehicle when operated on a public space or at or across the boundary of private property when operated on private property This section shall apply to all recreational motorized vehicles, whether or not duly licensed and registered, including, but not limited to, commercial or non-commercial racing vehicles, motorcycles, go-carts, snowmobiles, amphibious craft, campers and dune buggies, but not including motorboats.
- [(b) Permits for new vehicle racing events may be obtained from the (appropriate authority) according to procedures and criteria set forth in .....] ]
- [(c) Special variances for ..... may be obtained from. (appropriate authority) according to procedure and criteria set forth in .....] ]

**TABLE 3  
RECREATIONAL MOTORIZED  
VEHICLE SOUND LIMITS  
(MEASURED AT 50 FEET OR 15 METERS)**

Vehicle Type	Sound Level, dBA
Snowmobile	A
Motorcycle	B
Any Other Vehicle	C

**ARTICLE X Land Use**

**10.1 General Provisions**

- (a) No owner of any land shall commence or cause to be commenced the construction of any structure covered by Sections 10.2. 10.3. 10.5 or 10.6 unless approved by the NCO as provided in this Article.
- (b) Any application for approval required by this Article shall be submitted in writing to the NCO,

with a copy to the (Building Department)/ (Appropriate Department), by the owner of the land on which the Structure is proposed to be constructed and shall contain the following information:

- (1) identification of the land on which the construction is proposed;
- (2) the section of this Article under which approval is requested;
- (3) information and data supporting the claim that the appropriate requirements will be met; and,
- (4) any other information which the NCO may reasonably require.

#### 10.2 Construction Restrictions for Habitable and Institutional Structures

(a) Except as provided in subsection (c), no new single family residential structure shall be approved for construction (excluding substantial repair or alteration) if the exterior day-night average sound level ( $L_{dn}$ ) anywhere on the site of the proposed structure is projected to be in excess of ..... dBA within ..... years following the estimated completion date of the structure.

(b) Except as provided in subsection (c), no new multiple-family residence, dormitory, mobile home park, transient lodging, school, hospital, nursing home or similar structure, or substantial modification of such existing structure, shall be approved for construction if the exterior day-night average sound level ( $L_{dn}$ ) anywhere on the site of the proposed structure is projected to be in excess of ..... dBA within ..... years following the estimated completion date of the structure or modification.

(c) Construction otherwise prohibited pursuant to subsections (a) or (b) shall be allowed if the exterior day-night average sound level ( $L_{dn}$ ) on the site of the proposed structure is projected not to be in excess of ..... dBA for ..... years following construction, provided that there is incorporated into the design and construction of the structure such sound attenuation measures as are necessary to reduce the maximum interior day-night average sound level ( $L_{dn}$ ) to ..... dBA. Subsections (a) and (b) shall not apply to any site development plan or its equivalent on which four or fewer dwelling units are to be constructed.

(d) Prior to issuance of any occupancy permit for any structure regulated pursuant to subsection (c), the owner of the structure shall submit for NCO review the report of an independent testing agency [approved by the NCO] certifying that sound attenuation measures have been property incorporated into the design and construction of the structure and that the interior  $L_{dn}$  meets the criterion specified in subsection (c). Such report shall contain the results of simultaneous measurements of the exterior and interior day-night average sound levels for a representative sample of locations.

(e) The NCO may conduct such inspections and measurements as are necessary to ensure the accuracy of any report submitted pursuant to subsection (d) and to ascertain compliance with this section. These may include on-site inspections by a certified independent testing agency during specified periods of construction.

#### 10.3 Recreational Area Restrictions

(a) Except as provided in subsections (b), (c), and (d) no land shall be designated or approved for construction or use as a public or private exterior recreational area, including, but not limited to, child playgrounds, outdoor theaters and amphitheaters, picnic grounds, tennis courts and swimming pools, if the exterior day-night average sound level ( $L_{dn}$ ) anywhere on the site of the proposed recreational area is projected to be in the excess of ..... dBA within ..... years following the construction or designation of the site.

(b) This section shall not apply to the designation or approval of any green belt or open space in any area in which the  $L_{dn}$  exceeds the level specified in subsection (a) regardless of whether such green belt or open space is open to public use, provided that no recreational improvement or facility is constructed thereon.

(c) Designation or approval of exterior recreational areas otherwise prohibited under subsection (a) shall be allowed if the  $L_{dn}$  specified in that subsection can be achieved by appropriate means of sound attenuation, such as berms, barriers, or buildings, at the perimeter of or elsewhere on the site.

(d) No new interior recreational facility, including, but not limited to, gymnasiums, ice or roller skating rinks, indoor swimming pools, and tennis courts, shall be approved for construction if the exterior day-night average sound level anywhere on the site is projected to be in excess of ..... dBA within ..... years following the estimated date of completion of the structure unless there is incorporated into the design and construction of the structure such sound attenuation measures as are necessary to reduce the maximum interior day-night average sound level ( $L_{dn}$ ) to ..... dBA.

#### 10.4 Site Study Requirement

(a) If the NCO has reason to believe that a full report is necessary to determine whether a proposed project is prohibited under Section 10.1 such report shall be made by the applicant prior to approval of any subdivision, zoning, or building permit application. (If a full report has not been made and the applicant believes the project was wrongfully prohibited under Section 10.1, he may file a full report within ..... days of the NCO decision and request reconsideration by the NCO. A full report shall contain the following information and any other information which the NCO may reasonably require:

(1) the existing day-night average sound levels  $L_{dn}$ , including identification of the major sources of sound, for a representative sample of locations measured in accordance with guidelines published by the NCO;

(2) any projected or proposed new or expanded sources of sound which may affect exposure of the site during ..... years following completion of the project and the projected future  $L_{dn}$ , at the site resulting from these new or expanded sources; and,

(3) where applicable, plans for sound attenuation measures on the site and/or of the structure proposed to be built and the amount of sound

attenuation anticipated as a result of these measures. (b) In determining whether an applicant should be required to submit a full report pursuant to subsection (a), the EPO/NCO shall consider Circular 1390.2 (None Abatement and Control) and other publications of the U.S. Department of Housing and Urban Development.

**10.5 Commercial and Industrial Construction**

No new or substantially modified structure on land used or zoned as commercial or industrial shall be approved for construction unless the owner or developer of such land has demonstrated, in accordance with guidelines published by the NCO, that the completed structure and the activities associated with and on the same property as the structure, will comply with the provisions of Article VIII at the time for initial full-scale operation of such activities.

**10.6 Sound From New Transportation Systems in Residential Areas or Noise Sensitive Zones**

No plans for construction of new transportation systems or expansion of the capacity of existing transportation systems will be approved for location in or near residential areas or noise sensitive zones, regardless of the source of project funds, unless such plan includes all control measures necessary to ensure that the projected day-night average sound level ( $L_{dn}$ ) due to the operation of the transportation system does not exceed ..... dBA at any point on residential property within ..... years after the expected completion of the project.

**10.7 Equivalent Measurement Systems**

For the purposes of this Article, all measurements and designations of sound levels shall be expressed in day-night average sound levels ( $L_{dn}$ ) or in any other equivalent measurement system the NCO may reasonably approve.

**10.8 Zoning Ordinance or Comprehensive Plan**

(a) No proposed zoning ordinance or comprehensive plan shall be approved unless such plan includes a sound analysis which:  
(1) identifies existing and projected noise sources and associated sound levels for ..... years in and around the area under consideration, and  
(2) ensures usage of adequate measures to avoid violation of any provision of this ordinance.  
(b) No zoning change application shall be approved unless the site feasibility study submitted as required by the (Zoning Board of Appeals)/ (Planning Commission), contains an analysis which shows:  
(1) the impact of existing and projected noise sources for ..... years on the intended use, and  
(2) the projected noise impact of the intended use, when completed, on surrounding areas. Such sites study shall ensure the use of adequate measures to avoid violation of any provision of this ordinance.

**10.9 Truth in Selling or Renting**

No person shall sell or rent, or cause to be sold or rented, any structure or property to be used for human habitation, where the structure or property is

exposed to sound levels regularly in excess of (an  $L_{eq}$  in any hour of ..... dBA)/(an  $L_{dn}$  of ..... dBA), without making full written disclosure to all potential buyers or renters of the existence of such sound levels and of the nature of the sources. The NCO shall develop a standard format for written disclosures, which shall include information on the effects of noise on human health and welfare.

**10.10 Appeal**

Any applicant may appeal an adverse decision by the NCO under the Article, in the (appropriate court of law), on the grounds that the NCO disapproval was arbitrary, capricious, or unreasonable.

**Article XI Enforcement**

**11.1 Penalties**

(a) Any person who violates any provision of this ordinance shall be fined for each offense not more than ..... dollars.  
(b) Any person who willfully or knowingly violates any provision of this ordinance shall be fined for each offense a sum of not less than ..... dollars and not more than ..... dollars.  
(c) Each day of violation of any provision of this ordinance shall constitute a separate offense.

**11.2 Abatement Orders**

[(a) Except as provided in subsection (b) in lieu of issuing a notice of violation as provided for in Section 11.3, the NCO or other (agency/official) responsible for enforcement of any provision of this ordinance may issue an order requiring abatement of any source of sound or vibration alleged to be in violation of this ordinance within a reasonable time period and according to guidelines [to be approved by appropriate authority] which the NCO may prescribe.  
(b) An abatement order shall not be issued:  
(1) for any violation covered by Section 11.1 (b);  
(2) for any violation of .....; or  
(3) when the NCO or other enforcement (agency) / (official) has reason to believe that there will not be compliance with the abatement order.]

**11.3 Notice of Violation**

[Except where a person is acting in good faith to comply with an abatement order issued pursuant to Section 11.2 (a)], violation of any provision of this ordinance shall be cause for a (notice of violation)/ (summons)/(complaint)/(information or indictment) to be issued by the NCO or other responsible enforcement (agency official) according to procedures (which the NCO may prescribe)/ (set forth in .....).

**11.4 Immediate Threats to Health and Welfare**

(a) The NCO shall order an immediate halt to any sound which exposes any person, except those excluded pursuant to subsection (b), to continuous sound levels in excess of those shown in Table 4 or to impulsive sound levels in excess of those shown in Table 5. Within ..... days following issuance of such an order, the NCO shall apply to the

appropriate court for an injunction to replace the order

(b) No order pursuant to subsection (a) shall be issued if the only persons exposed to sound levels in excess of those listed in Tables IV and V are exposed as a result of:

(1) trespass;

(2) invitation upon private property by the person causing or permitting the sound, or

(3) employment by the person or a contractor of the person causing or permitting the sound.

(c) Any person subject to an order issued pursuant to subsection (a) shall comply with such order until:

(1) the sound is brought into compliance with the order, as determined by the NCO, or

(2) a Judicial order has superseded the NCO order.

(d) Any person who violates an order issued pursuant to this section shall, for each day of violation, be fined not less than ..... dollars nor more than ..... dollars.

**TABLE 4**  
CONTINUOUS SOUND LEVELS WHICH POSE AN IMMEDIATE THREAT TO HEALTH AND WELFARE (Measured at 50 Feet or 15 Meters)<sup>1</sup>

Sound Level Limit (dBA)	Duration
90	24 hours
93	12 hours
96	6 hours
99	3 hours
102	1.5 hours
103	45 minutes
108	22 minutes

<sup>1</sup> Use equal energy time-intensity trade-off if level varies; find energy equivalent over 24 hours.

**TABLE 5**  
IMPULSIVE SOUND LEVELS WHICH POSE AN IMMEDIATE THREAT TO HEALTH AND WELFARE (Measured at 50 Feet or 15 Meters)

Sound Level Limit (dBA)	Number of Repetitions per 24 Hour Period
145	1
135	10
125	100

**11.5 Citizen Suits**

(a) Any person, other than persons responsible for enforcement of this ordinance, may commence a civil action on his own behalf against:

(1) any person who is alleged to be in violation of any provision of this ordinance set forth in Table 6 below or

(2) the NCO where there is alleged a failure of the NCO to perform any act under this ordinance which is not discretionary. The ..... court shall have Jurisdiction, without regard to the amount in

controversy, to grant such relief as it deems necessary.

(b) No action may be commenced:

(1) under Subsection (a)(1)

(A) prior to ..... days after the plaintiff has given notice of the alleged violation to the NCO [and to the alleged violator] of such violation, or

(B) if the NCO has commenced and is diligently prosecuting an action against the alleged violator with respect to such violation, [but in such action any affected person may intervene as a matter of right], or

(2) under Subsection (a)(2), prior to ..... days after the plaintiff has given notice to the NCO that he will commence such action. Notice under this subsection shall be given in a manner prescribed by the NCO.

(c) In any action under this section, the NCO, if not a party, may intervene as a matter of right.

(d) The court, in issuing any final order in any action brought pursuant to subsection (a), may at its discretion award the costs of litigation to any party.

**TABLE 6**  
Provisions Under Which Civil Actions May Be Commenced

6.2.1(a)	(Radios, Television Sets, Musical Instruments and Similar Devices)
6.2.2	(Loudspeakers/Public Address Systems)
6.2.3	(Street Sales)
6.2.5	(Loading and Unloading)
6.2.6	(Construction)
6.2.7	(Vehicle or Motorboat Repairs and Testing)
6.2.9	(Places of Public Entertainment)
6.2.10	(Explosives, Firearms, and Similar Devices)
6.2.11	(Powered Model Vehicles)
6.2.12	(Vibration)
[6.2.13	(Stationary, Non-Emergency Signaling Devices)
6.2.14	(Emergency Signaling Devices)
6.2.15	(Motorboats)
6.2.17	(Domestic Power Tools)
6.2.18	(Tampering)
8.1	(Maximum Permissible Sound Levels by Receiving Land Use)
9.1.3	(Refuse Collection Vehicles)
9.1.4	(Standing Motor Vehicles)
9.2(b)	(Motor Vehicle Racing Events)
9.2.1(b)	(Motor Vehicle Horns and Signaling Devices)
10.9	(Truth-in Selling or Renting)

**11.6 Other Remedies**

No provision of this ordinance shall be construed to impair any common law or statutory cause of action, or legal remedy there from, of any person for injury or damage arising from any violation of this ordinance or from other law.



**11.7 Severability**

If any provision of this ordinance is held to be unconstitutional or otherwise invalid by any court of competent jurisdiction, the remaining provisions of the ordinance shall not be invalidated.

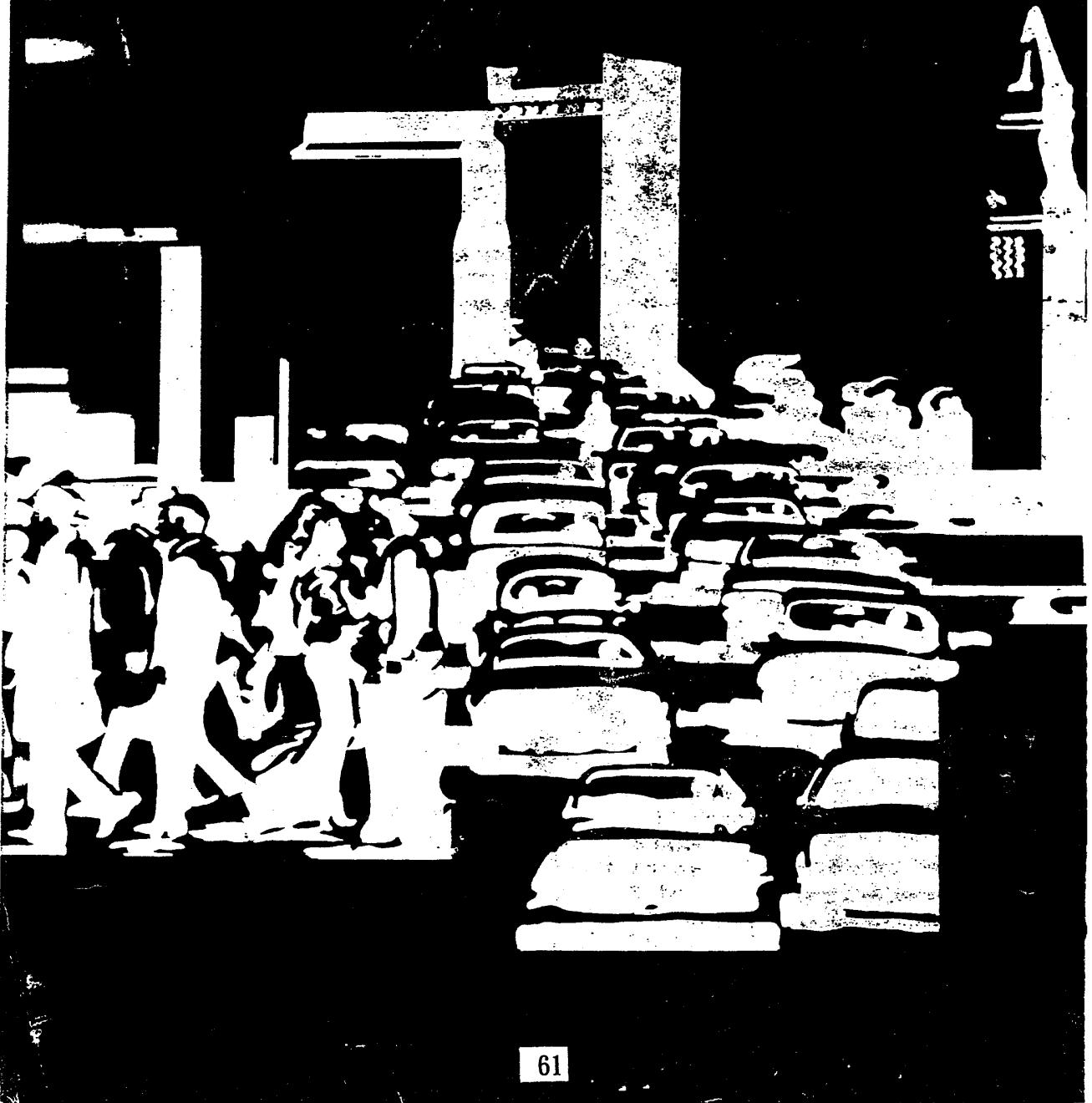
**11.8 Effective Date**

This law/ordinance shall take the effect on  
.....



# Protective Noise Levels

## Condensed Version of EPA Levels Document



## **PURPOSE**

This publication is intended to complement the EPA's "Levels Document,"\* the 1974 report examining levels of environmental noise necessary to protect public health and welfare. It interprets the contents of the Levels Document in less technical terms for people who wish to better understand the concepts presented there, and how the protective levels were identified. In that sense, this publication may serve as an introduction, or a supplement, to the Levels Document.

\*"Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," EPA/ONAC 550/9-74-004, March, 1974.

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## 1 INTRODUCTION

During the last 20 years there has been increasing concern with the quality of the environment. Along with air and water contaminants, noise has been recognized as a serious pollutant. As noise levels have risen, the effects of noise have become pervasive and more apparent.

Noise is defined as "unwanted sound." In the context of protecting the public health and welfare, noise implies adverse effects on people and the environment. Noise causes hearing loss, interferes with human activities at home and work, and is in various ways injurious to people's health and well-being. Although hearing loss is the most clearly measurable health hazard, noise is also linked to other physiological and psychological problems.

Noise annoys, awakens, angers and frustrates people. It disrupts communication and individual thoughts, and affects performance capability. Noise is one of the biological stressors associated with everyday life. Thus, the numerous effects of noise combine to detract from the quality of people's lives and the environment.

Noise emanates from many different sources. Transportation noise, industrial noise, construction noise, household noise, and people and animal noise are all large-scale offenders. It is important, then, to examine the total range and combination of noise sources and not to focus unduly on any one source.

Through the Noise Control Act of 1972, Congress directed the Environmental Protection Agency (EPA) to publish scientific information about the kind and extent of all identifiable effects of different qualities and quantities of noise. EPA was also directed to define acceptable levels under various conditions which would protect public health and welfare with an adequate margin of safety. The EPA collaborated with other Federal agencies and the scientific community to publish a "Levels Document,"\* which would fulfill these requirements in the Noise Control Act.

Initial public reaction was quite favorable, but it was discovered that the document was too complex, too technical, and too long for some audiences. This summary presents the contents of the Levels Document in less technical terms. It defines the basic measurement of noise, analyzes noise exposure, and presents the best understood effects of noise — hearing damage, speech interference, and annoyance — using information contained in the Levels Document. The identified protective levels are then summarized, followed by a number of often-asked questions and answers about the Levels Document.

No attempt has been made here to incorporate recent research findings pertaining to effects of noise on people. Considerable new information has developed since initial publication of the Levels Document, including new findings on community response to noise, sleep disruption, and speech interference. Summaries and analyses of some recent information on noise effects are available through EPA and other agencies.

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\* "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety", EPA 550/9-74-004, March, 1974, U.S. Environmental Protection Agency, Washington, D.C. 20460.

The sound we hear is the result of a sound source inducing vibration in the air. The vibration produces alternating band of relatively dense and sparse particles of air, spreading outward from the source in the same way as ripples do on water after a stone is thrown into it. The result of the movement of the particles is a fluctuation in the normal atmospheric pressure, or sound waves. These waves radiate in all directions from the source and may be reflected and scattered or, like other wave actions, may turn corners. When the source stops vibrating, the sound waves disappear almost instantaneously, and the sound ceases. The ear is extremely sensitive to sound pressure fluctuations, which are converted into auditory sensations.

Sound may be described in terms of three variables:

1. Amplitude (perceived as loudness)
2. Frequency (perceived as pitch)
3. Time pattern

### Amplitude

Sound pressure is the amplitude or measure of the difference between atmospheric pressure (with no sound present) and the total pressure (with sound present). Although there are other measures of sound amplitude, sound pressure is the fundamental measure and is the basic ingredient of the various measurement descriptors in the next section, "Measurement of Environmental Noise."

The unit of sound pressure is the decibel (dB); thus it is said that a sound pressure level is a certain number of decibels. The decibel scale is a logarithmic scale, not a linear one such as the scale of length. A logarithmic scale is used because the range of sound intensities is so great that it is convenient to compress the scale to encompass all the sounds that need to be measured. The human ear has an extremely wide range of response to sound amplitude. Sharply painful sound is 10 million times greater in sound pressure than the least audible sound. In decibels, this 10 million to 1 ratio is simplified logarithmically to 140 dB.

Another unusual property of the decibel scale is that the sound pressure levels of two separate sounds are not directly (that is, arithmetically) additive. For example, if a sound of 70 dB is added to another sound of 70 dB, the total is only a 3-decibel increase (to 73 dB), not a doubling to 140 dB. Furthermore, if two sounds are of different levels, the lower level adds less to the higher as this difference increases. If the difference is as much as 10 dB, the lower level adds almost nothing to the higher level. In other words, adding a 60 decibel sound to a 70 decibel sound only increases the total sound pressure level less than one-half decibel.

### Frequency

The rate at which a sound source vibrates, or makes the air vibrate, determines frequency. The unit of time is usually one second and the term "Hertz" (after an early investigator of the physics of sound) is used to designate the number of cycles per second.

The human ear and that of most animals has a wide range of response. Humans can identify sounds with frequencies from about 16 Hz (Hertz) to 20,000 Hz. Because pure tones are relatively rare in real life situations, most sounds consist instead of a complex mixture of many frequencies.

### Time Pattern

The temporal nature of sound may be described in terms of its pattern of time and level: continuity, fluctuation, impulsiveness, intermittency. Continuous sounds are those produced for relatively long periods at a constant level, such as the noise of a waterfall. Intermittent sounds are those which are produced for short periods, such as the ringing of a telephone or aircraft take-offs and landings. Impulse noises are sounds which are produced in an extremely short span of time, such as a pistol shot or a hand clap. Fluctuating sounds vary in level over time, such as the loudness of traffic sounds at a busy intersection.

## MEASUREMENT OF ENVIRONMENTAL NOISE: SOUND DESCRIPTORS

EPA has adopted a system of four "sound descriptors" to summarize how people hear sound and to determine the impact of environmental noise on public health and welfare. These four descriptors are the A-weighted Sound Level, A-weighted Sound Exposure Level, Equivalent Sound Level, and Day-Night

Sound Level. They are related but each is most useful for a particular type of measurement. The descriptors and some examples of their uses are described below.

### A-weighted Sound Level

One's ability to hear a sound depends greatly on the frequency composition of the sound. People hear sounds most readily when the predominant sound energy occurs at frequencies between 1000 and 6000 Hertz (cycles per second). Sounds at frequencies above 10,000 Hertz (such as high-pitched hissing) are much more difficult to hear, as are sounds at frequencies below about 100 Hz (such as a low rumble). To measure sound on a scale that approximates the way it is heard by people, more weight must be given to the frequencies that people hear more easily.

A method for weighting the frequency spectrum to mimic the human ear has been sought for years. Many different scales of sound measurement, including A-weighted sound level (and also B, C, D, and E-weighted sound levels) have evolved in this search. A-weighting was recommended by EPA to describe environmental noise because it is convenient to use, accurate for most purposes, and is used extensively throughout the world. Figure 1 shows the A-weighted levels of some environmental noises. Note that these ranges of measured values are the maximum sound levels.

The A-weighting of frequency also is used in the three descriptors discussed below. When used by itself, an A-weighted decibel value denotes either a sound level at a given instant, a maximum level, or a steady-state level. The following three descriptors are used to summarize those levels which vary over time.

### Sound Exposure Level

Since the levels of many sounds change from moment to moment, this variation must also be accounted for when measuring environmental noise. One method for measuring the changing magnitude of sound levels is to trace a line on a sheet of moving paper, so that the movement of the pen is proportional to the sound level in decibels. Figure 2 illustrates such a recording, about which several features are noteworthy. First, the sound level varies with time over a range of about 30 dB. Second, the sound appears to be characterized by a fairly steady-state lower level, upon which are superimposed sound levels associated with individual events. This fairly constant lower level is often called the background ambient sound level.

Each single event in Figure 2 may be partially characterized by its maximum level. It may also be partially characterized by its time pattern. In the example, the sound level of the aircraft is above that of the background ambient level for about a minute, whereas the sound levels from cars are above the background level for much less time.

The duration of sounds with levels that vary from moment to moment is more difficult to characterize. One way is to combine the maximum sound level with the length of time during which the sound level is greater than a certain number of decibels below the maximum level — for example, the number of seconds that the sound rises from 10 dB below maximum, as in Figure 3.

Using this procedure one can measure the total energy of the sound by summing the intensity during the exposure duration. This procedure produces the second measurement descriptor, *sound exposure level* ( $L_s$ ), referred to in the Levels Document as the single event noise exposure level (SENEL).

### Equivalent Sound Level

Yet another method of quantifying the noise environment is to determine the value of a steady-state sound which has the same A-weighted sound energy as that contained in the time-varying sound. This is the third measurement descriptor, termed the *Equivalent Sound Level* ( $L_{eq}$ ). The Equivalent Sound Level is a single value of sound level for any desired duration, which includes *all* of the time-varying sound energy in the measurement period. In Figure 2, for example, the  $L_{eq}$  equals about 58 dB, indicating that the amount of sound energy in all the peaks and valleys in the figure is equivalent to the energy in a continuous sound of 58 dB.

The major virtue of the Equivalent Sound Level is that it correlates reasonably well with the effects of noise on people, even for wide variations in environmental sound levels and time patterns. It is used when only the durations and levels of sound, and not their times of occurrence (day or night), are relevant. It is easily measurable by available equipment. It also is the basis of a fourth and final measurement descriptor of the total outdoor noise environment, the *Day-Night Sound Level* ( $L_{dn}$ ).

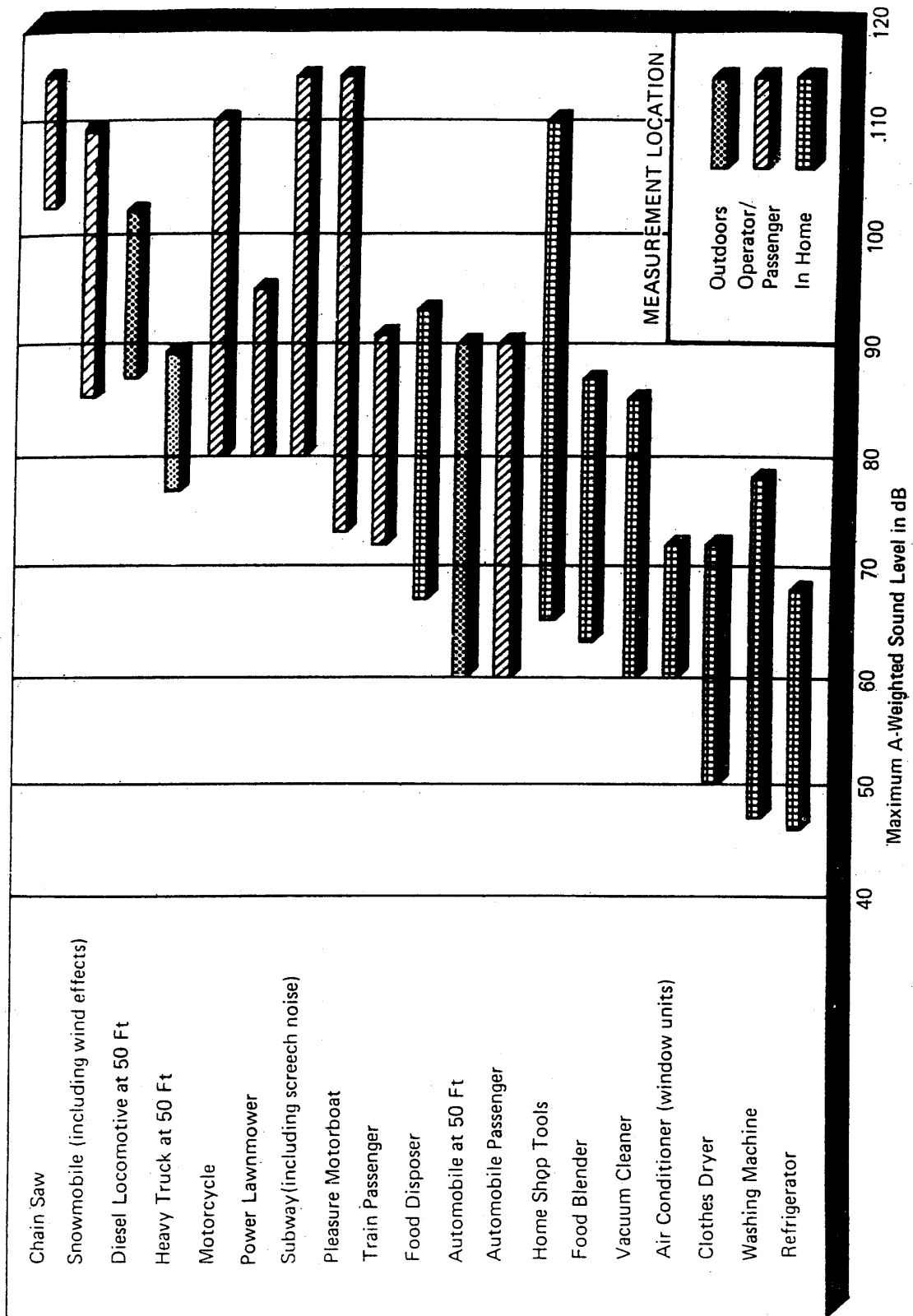


FIGURE 1. TYPICAL RANGE OF COMMON SOUNDS



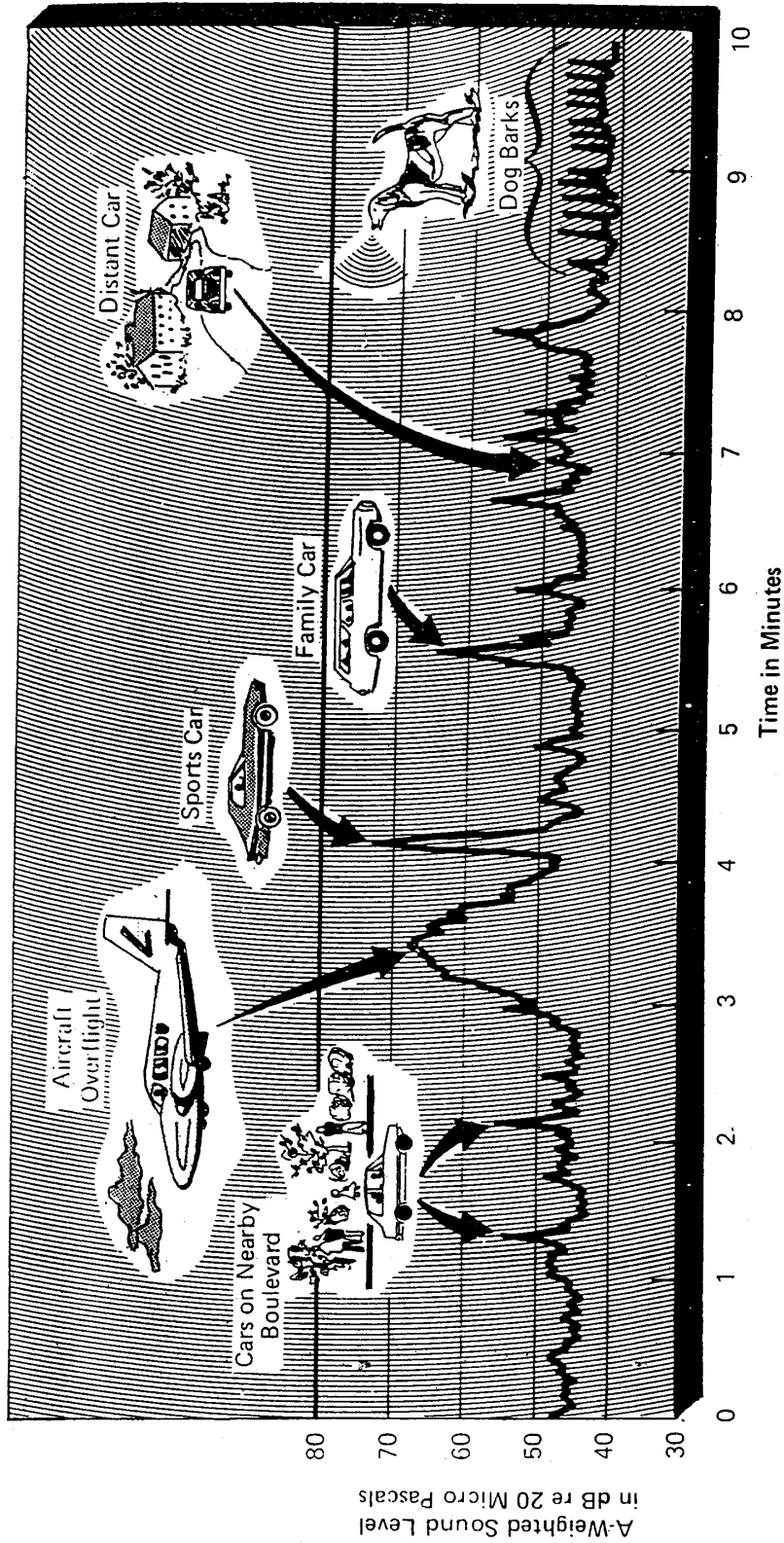


FIGURE 2. TYPICAL OUTDOOR SOUND MEASURED ON A QUIET SUBURBAN STREET

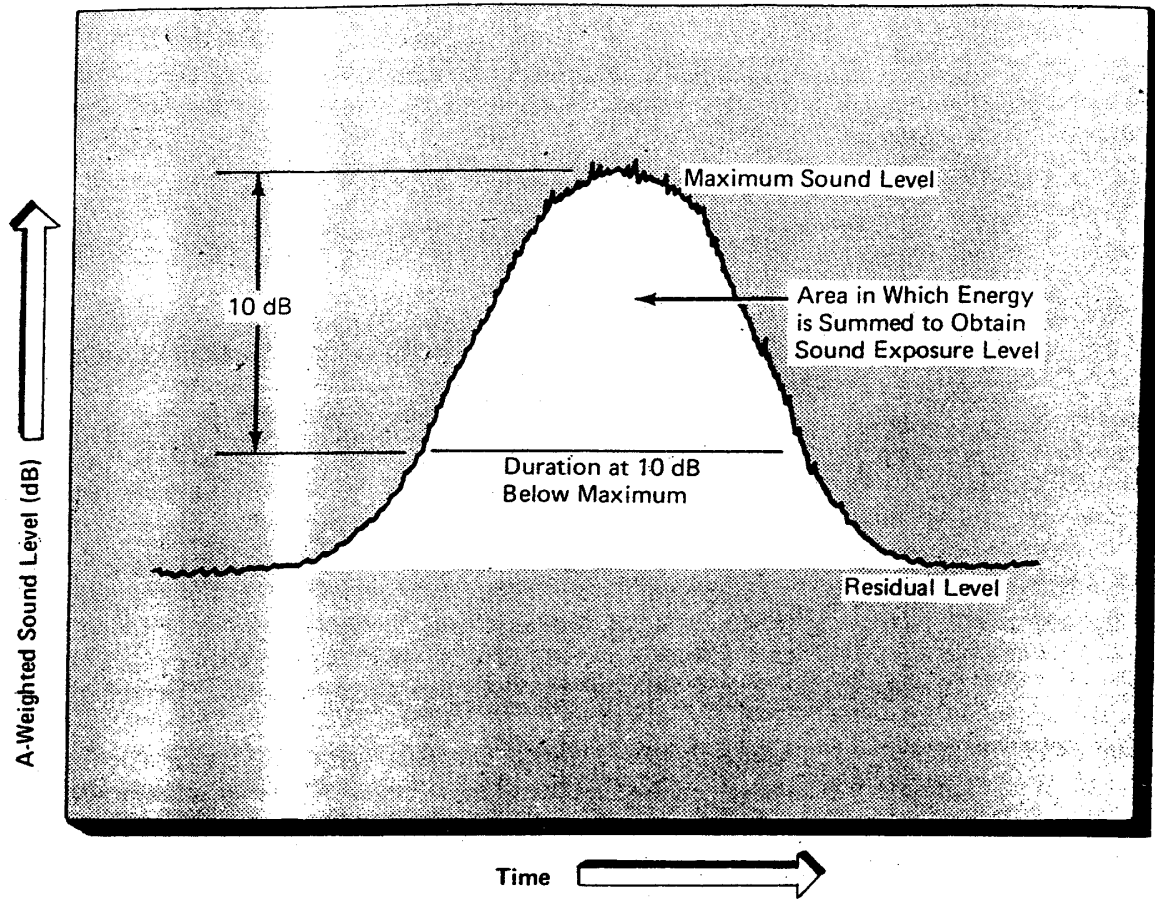


FIGURE 3. DESCRIPTION OF THE SOUND OF A SINGLE EVENT

L<sub>dn</sub> in dB

Outdoor Location

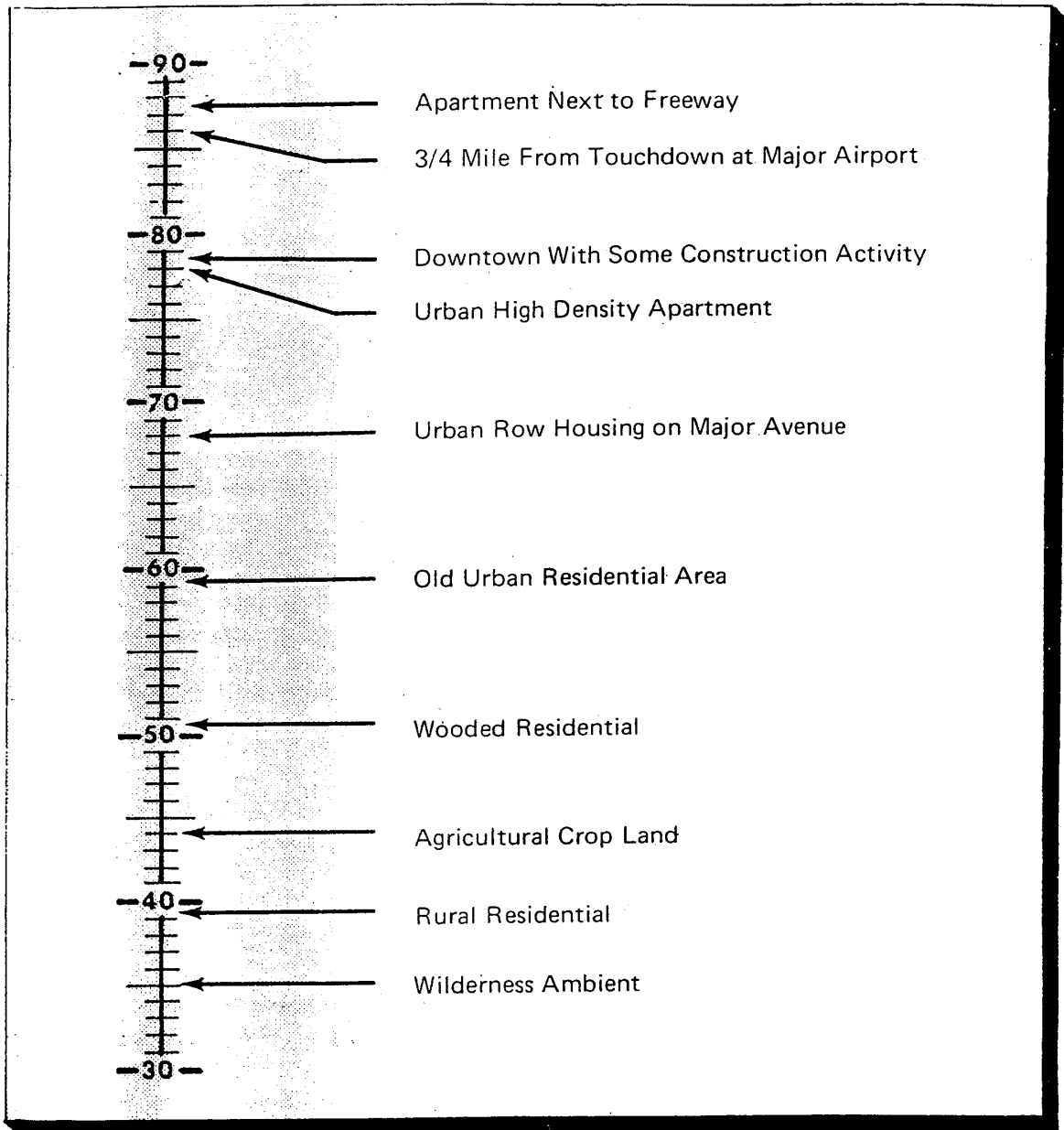


FIGURE 4. EXAMPLES OF OUTDOOR DAY-NIGHT AVERAGE SOUND LEVELS IN dB MEASURED AT VARIOUS LOCATIONS

## Day-Night Sound Level

The Day-Night Sound Level is the A-weighted equivalent sound level for a 24-hour period with an additional 10 dB weighting imposed on the equivalent sound levels occurring during nighttime hours (10 pm to 7 am). Hence, an environment that has a measured daytime equivalent sound level of 60 dB and a measured nighttime equivalent sound level of 50 dB, can be said to have a weighted nighttime sound level of 60 dB (50 + 10) and an  $L_{dn}$  of 60 dB. Examples of measured  $L_{dn}$  values are shown in Figure 4. Table I summarizes the use of the four sound descriptors used by EPA.

Table I. Descriptors of Sound\*

TYPICAL USE	NAME OF DESCRIPTOR	NATURE OF DESCRIPTOR
To describe steady airconditioning sound in a room or measure maximum sound level during a vehicle passby with a simple sound level meter.	A-weighted Sound Level	The momentary magnitude of sound weighted to approximate the ear's frequency sensitivity.
To describe noise from a moving source such as an airplane, train, or truck.	A-weighted Sound Exposure Level	A summation of the energy of the momentary magnitudes of sound associated with a single event to measure the total sound energy of the event.
To measure average environmental noise levels to which people are exposed.	Equivalent Sound Level	The A-weighted sound level that is "equivalent" to an actual time varying sound level, in the sense that it has the same total energy for the duration of the sound.
To characterize average sound levels in residential areas throughout the day and night.	Day-Night Sound Level	The A-weighted equivalent sound level for a 24-hour period with 10 decibels added to nighttime sounds (10 pm - 7 am).

\*The unit for all descriptors is the decibel.

## LEVELS OF ENVIRONMENTAL NOISE IN THE UNITED STATES

In residential areas of the United States, major contributions to outdoor noise come from transportation, industrial, construction, human and animal sources. Inside homes, appliances, radio and television, as well as people and animals, are predominant noise sources. On the job, workplace equipment can create moderate to extremely high levels of noise. The daily noise exposure of people depends on how much time they spend in different outdoor and indoor locations and on the noise environments in these places. Typical daily exposure patterns are discussed in this section, following short descriptions of outdoor and indoor levels of environmental noise throughout the United States.

### Outdoor Levels

The noise environment outside residences in the United States can be highly variable. As seen in Figure 4, outdoor Day-Night Sound Levels in different areas vary over a range of 50 dB. Levels occur as low as  $L_{dn} = 30$  to 40 dB in wilderness areas and as high as  $L_{dn} = 85$  to 90 dB in urban areas.

Most Americans live in areas with a much smaller range of outdoor noise levels. Figure 5 shows that for urban dwellers (roughly 135 million people, more than half the U.S. population), 87% live in areas of  $L_{dn} = 48$  and higher from traffic noise alone. Most of the other 13% of the urban population experience lower noise levels than those of Figure 5. Figure 5 also shows that nearly half of the urban population live in areas exposed to traffic sounds that range over only 5 dB ( $L_{dn} = 55$  to 60 dB). Rural populations enjoy average outdoor sound levels generally lower than  $L_{dn} = 50$  dB.

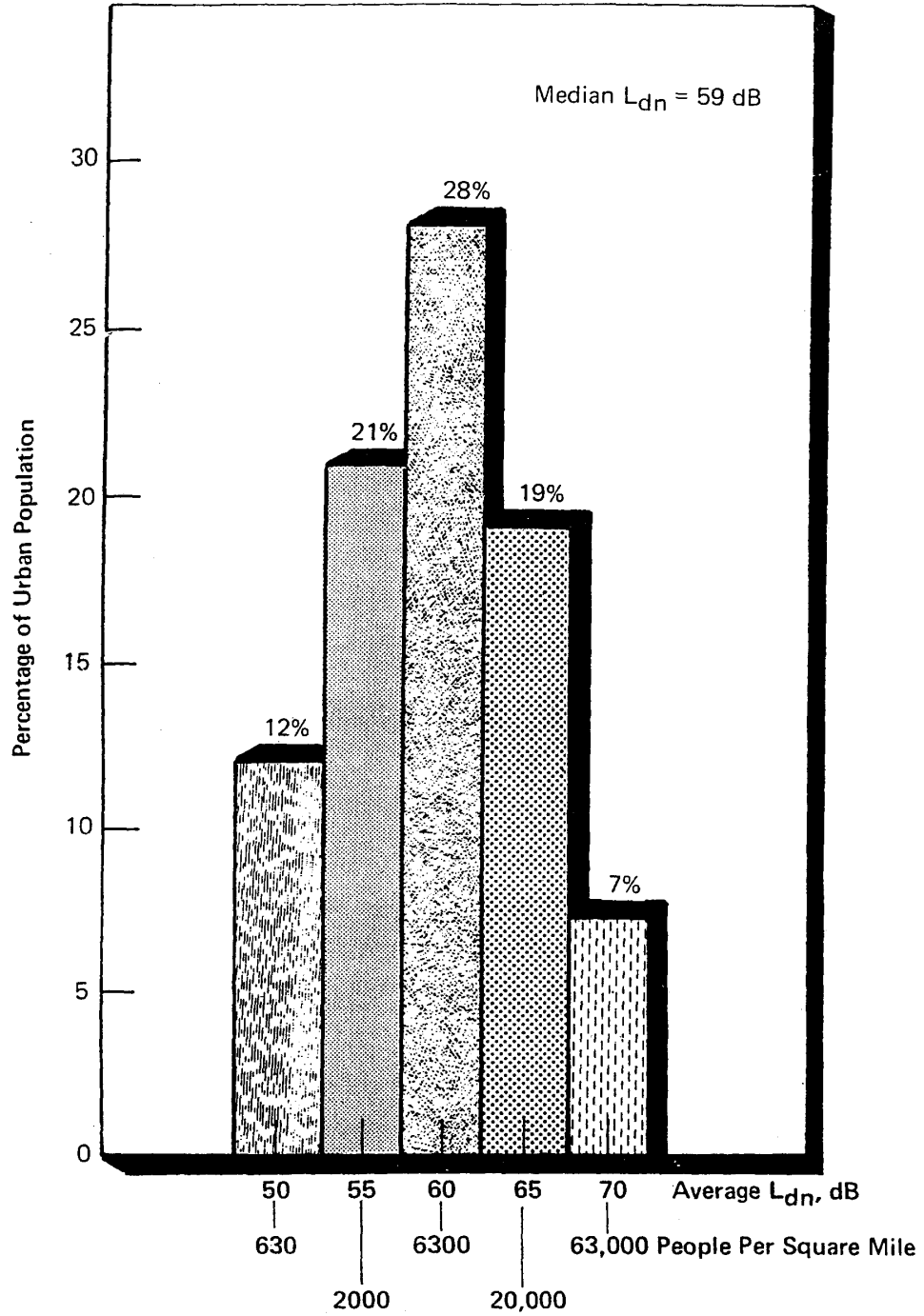


FIGURE 5. ESTIMATED PERCENTAGE OF URBAN POPULATION EXPOSED TO OUTDOOR DAY-NIGHT SOUND LEVELS DUE TO TRAFFIC

It is useful to know the number of people living in areas characterized by different levels of environmental noise. Figure 6 presents estimates for urban traffic, freeway traffic, and aircraft noise. The figure shows that urban traffic noise is much more widespread than either aircraft or freeway noise, but the figures are not strictly additive, because many of the people counted in one category are also exposed to another category of noise. Fifty-nine million people live in areas with urban traffic noise of  $L_{dn} = 60$  dB or higher, in contrast to only 16 million and 3.1 million people who live in areas with outdoor levels of  $L_{dn} = 60$  dB or higher for aircraft and freeway noise, respectively. On the other hand, more people are exposed to higher levels of noise from freeway and aircraft operations than from urban traffic: about 300,000 people live in areas exposed to levels of  $L_{dn} = 80$  dB or higher from freeway traffic; 200,000 from aircraft operations; and 100,000 from urban traffic. Bear in mind, however, that there may be differences between individual at-ear exposure levels and outdoor levels, because people move from place to place for varying amounts of time.

#### Relationship Between Indoor and Outdoor Levels

The contribution of outdoor noise to indoor noise levels is usually small. That part of a sound level within a building caused by an outdoor source obviously depends on the source's intensity and the sound level reduction afforded by the building. Although the sound level reduction provided by different buildings differs greatly, dwellings can be categorized into two broad classes—those built in warm climates and those built in cold climates. Further, the sound level reduction of a building is largely determined by whether its windows are open or closed. Table II shows typical sound level reductions for these categories of buildings and window conditions, as well as an approximate national average sound level reduction.

Table II  
Typical Sound Level Reductions of Buildings

	Windows Opened	Windows Closed
Warm Climate	12 dB	24 dB
Cold Climate	17 dB	27 dB
Approximate National Average	15 dB	25 dB

Sample measurements of outdoor and indoor noise levels during 24-hour periods are depicted in Figure 7. Despite the sound level reduction of buildings, indoor levels are often comparable to or higher than levels measured outside. Thus, indoor levels often are influenced primarily by internal noise sources such as appliances, radio and television, heating and ventilating equipment, and people. However, many outdoor noises may still annoy people in their homes more than indoor noises do. Indeed, people sometimes turn on indoor sources to mask the noise coming from outdoors.

An example of the range of hourly sound levels measured inside living areas is plotted for each hour of the day in Figure 8. The figure shows the median levels and the range of levels observed for 80% of the data. During late night hours the typical hourly sound level was approximately 36 dB. This level was probably dominated by outdoor noise. However, during the day, the hourly average levels ranged from about 40 to 70 dB, indicating the wide range of activities in which people engage.

#### INDIVIDUAL NOISE EXPOSURE PATTERNS

During a 24-hour period, people are exposed to a wide range of noises, including noise at home, work, school, places of recreation, shopping establishments, and while enroute to these or other locations. Clearly, no single exposure pattern can be typical of all people, or even of those people who follow a common life style. Figure 9 shows hypothetical exposure patterns for broad classes of people. From these levels and some assumptions about the hours spent at different daytime activities, 24-hour average sound levels can be estimated for factory and office workers, housewives, and preschool and school-age children. Estimates based on these assumptions are found in Table III.

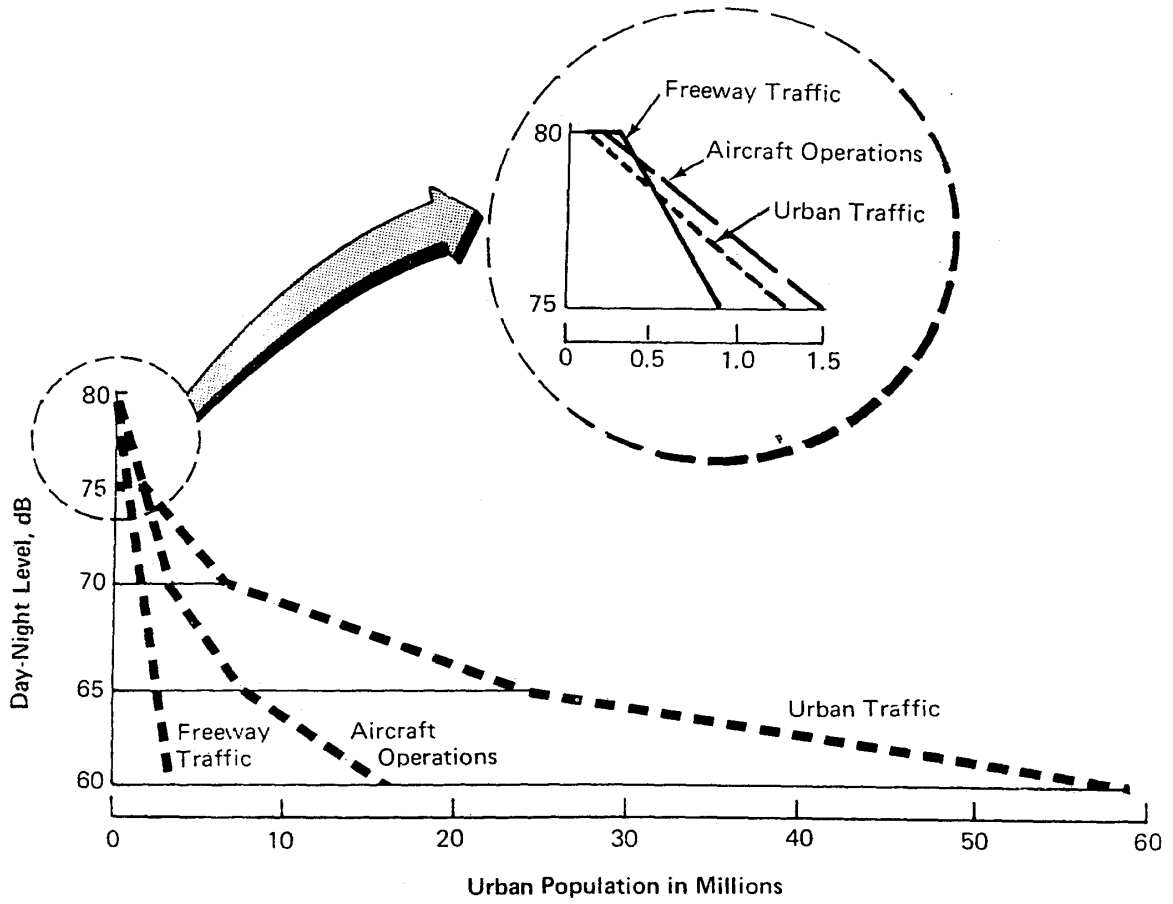


FIGURE 6. CUMULATIVE NUMBER OF PEOPLE IN URBAN AREAS EXPOSED TO OUTDOOR DAY-NIGHT AVERAGE SOUND LEVELS FROM DIFFERENT SOURCES

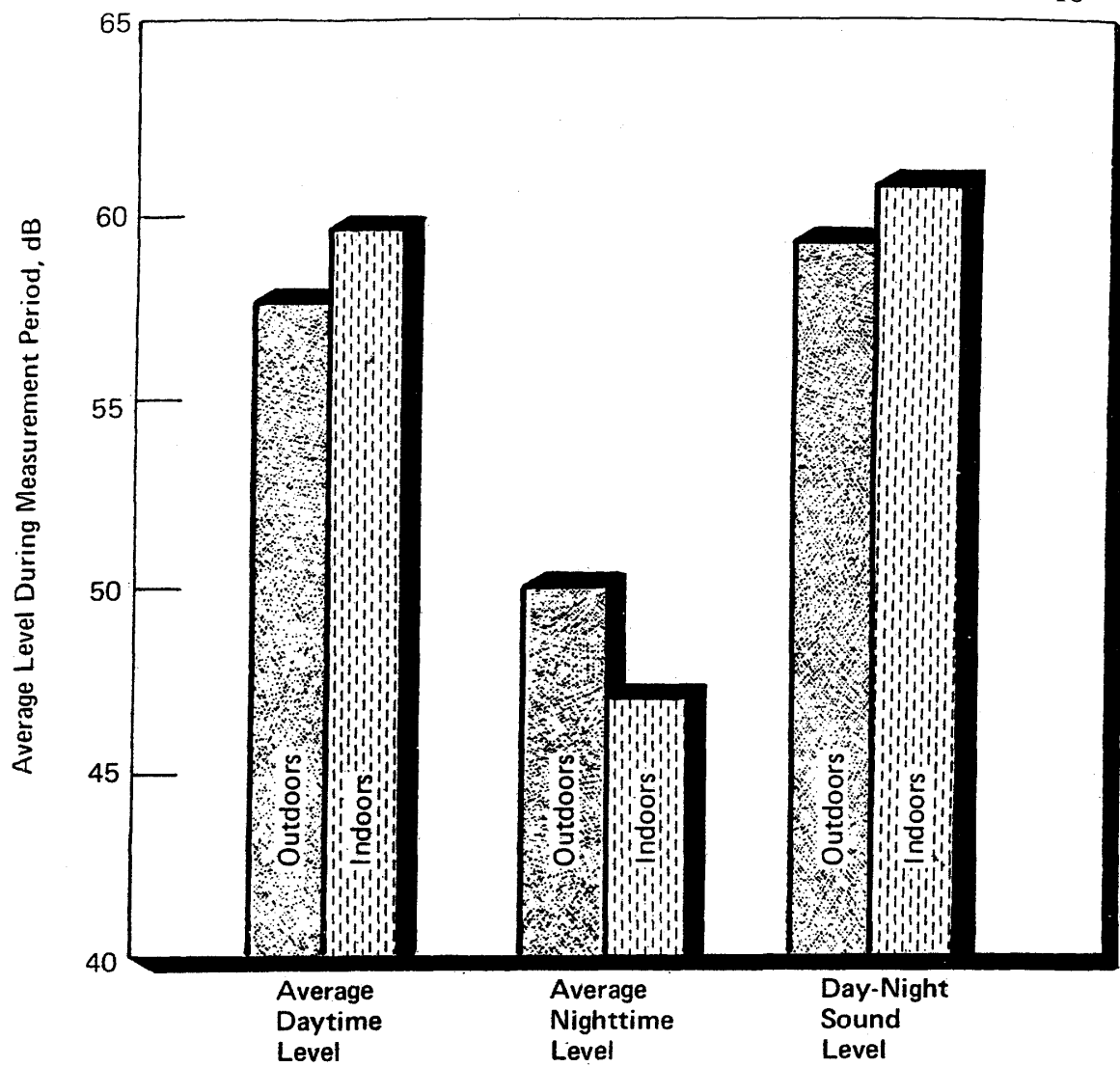


FIGURE 7. COMPARISON OF SAMPLE OUTDOOR AND INDOOR AVERAGE RESIDENTIAL SOUND LEVELS



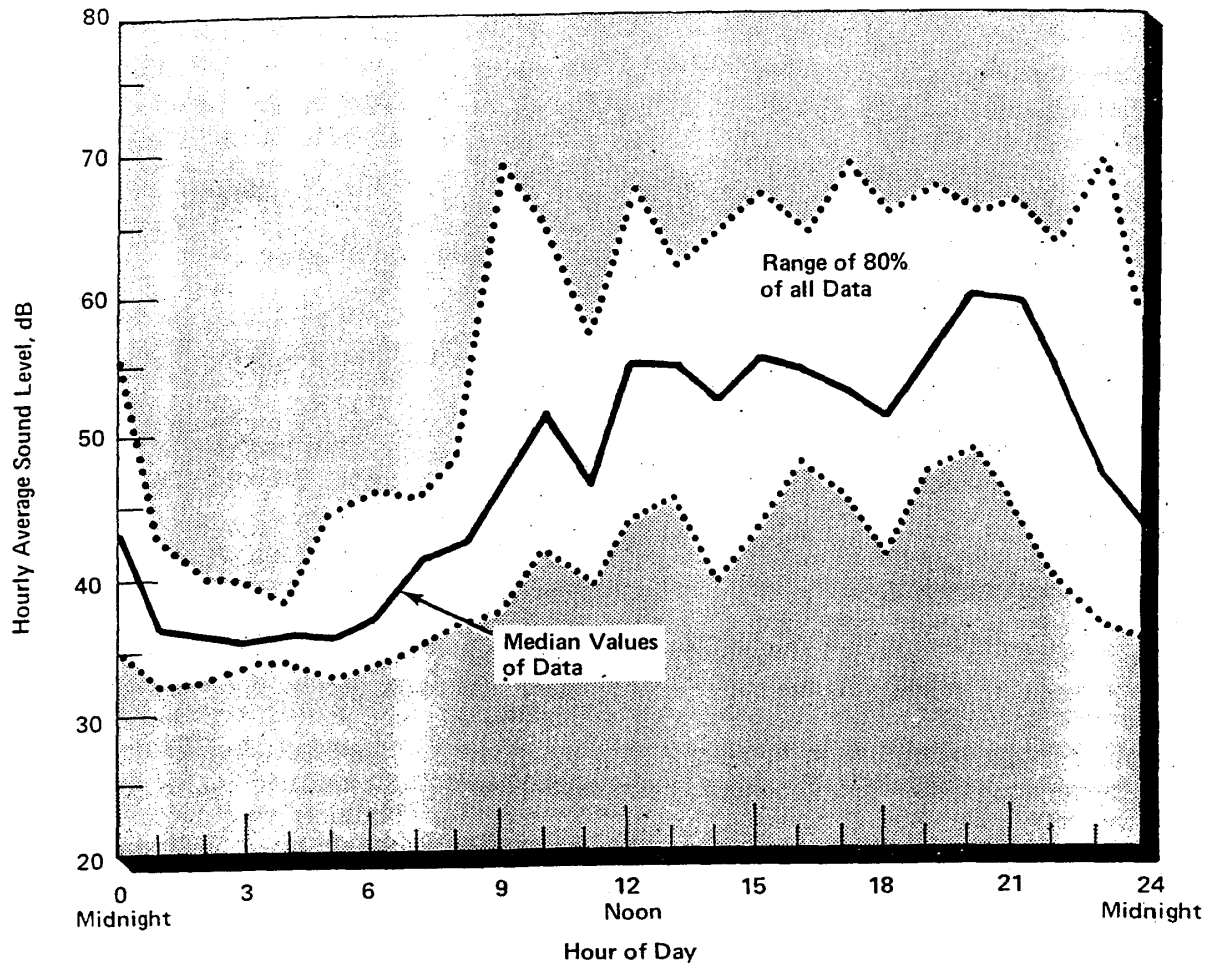


FIGURE 8. TIME PATTERN OF HOURLY INDOOR RESIDENTIAL SOUND LEVELS

For most people, nighttime noises do not contribute significantly to the 24-hour average. For many, the 24-hour average is determined primarily by the noise exposure of a single activity, frequently occurring for a short period of time.

Table III  
Hypothetical Examples of Noise Exposures of Individuals

Individual	24-Hour Average Sound Level, dB	
	Suburban Environment	Urban Environment
Factory Worker	87	87
Office Worker	72	70
Housewife	64	67
School Child	77	77

### HEARING DAMAGE FROM ENVIRONMENTAL NOISE

There is no question that exposure to certain levels of noise can damage hearing. However, determining exposure levels that protect hearing with an adequate margin of safety is a complicated matter.

This is because hearing is a complex ability that cannot be summarized by a single number in the way an individual's height or weight can be described. In fact, sizeable differences exist between individuals' hearing abilities. Hearing acuity tends to change progressively with age. Also, environmental noise exposure may vary considerably from moment to moment, so that specification of protective levels should include dynamic considerations. Further, relationships between hearing damage and noise exposure must be inferred, since available scientific information was gathered from groups of people who differed not only in noise exposure, but also in other important ways. Finally, individual and group noise exposures (especially over a working lifetime) are rarely known with precision.

In reaching conclusions about hearing loss, then, one must rely to a degree on assumptions, hypotheses, and extrapolations from existing data. Since complete agreement within the scientific community on these matters is lacking, an attempt was made in the Levels Document to consider alternative assumptions and hypotheses to ensure that the methods used to derive protective levels were based on the most defensible practice. As new data become available these levels may change slightly.

#### Basic Premises Involved in Determining Protective Levels

1. Changes in ability to hear in the region of 4000 Hz are the most important signs of irreversible hearing loss, indicating actual physiological destruction within the hearing mechanism. This frequency is usually the first frequency affected when the ear is damaged by exposure to noise. Furthermore, the protection of hearing acuity at this frequency is critical for understanding of speech and appreciation of music and other sounds.
2. Changes in individual hearing level, like changes in height or weight, are only significant if they are sizeable. Changes smaller than 5 dB are considered insignificant.
3. At all ages, it is assumed that hearing acuity cannot be damaged by sounds that cannot be heard. This may be important in that aging and other causes may produce appreciable shifts in hearing.
4. Because hearing ability varies from person to person, recommendations must be made in terms of a critical percentage of the population, ranked with superior hearing over the remainder. EPA's recommendations were based on the 96th percentile—that is, on providing protection for 96% of the people. It is assumed that people with poorer hearing than the 96th percentile are not affected by noise of typical levels (see 3 above), so that the recommendations protect virtually the entire population.
5. An individual's total noise exposure is evaluated by an "equal energy" rule: two noise exposures are expected to produce equal hearing loss if the product of exposure intensity and exposure time are equal. This rule allows a 3-dB decrease in sound pressure level (expressed in dB) for each doubling of the duration. Thus an exposure of 76 dB for one hour is equivalent to 73 dB for two hours, or 70 dB for four hours. This procedure is probably accurate for exposures of 30 minutes or more. It is also more protective for very short exposures and for noise that fluctuates greatly in level.

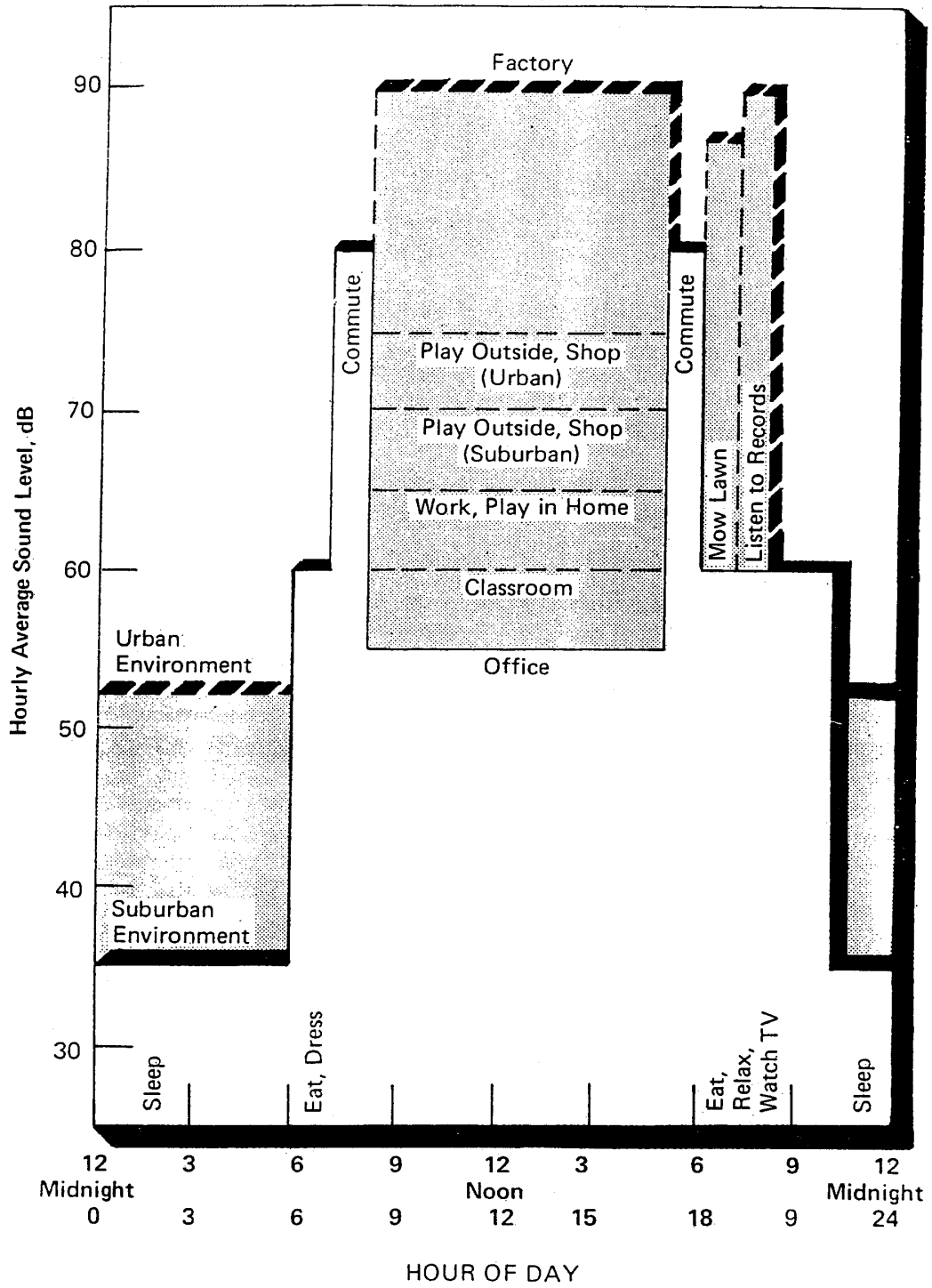


FIGURE 9. GENERALIZED INDIVIDUAL NOISE EXPOSURE PATTERNS

6. Intermittent noise produces less hearing damage than the "equal energy" rule would predict. To be considered intermittent for this purpose, a noise must fall below 65 dB for 10% of each hour and have peaks that exceed the background level by 5 to 15 dB. Intermittent noise is assumed to produce 5 dB less effect than does continuous noise of the same average level.

#### Calculation of the Maximum Allowable Noise Exposure

Three major scientific studies have attempted to assess hearing damage for various noise exposures. All are based on a comparison of groups of noise-exposed people and comparable non-exposed groups. All three studies attempted to predict hearing loss as a function of noise exposure of a certain percentage of people. Because these studies were of exposure to high-level noise, extrapolations of the data were necessary to estimate the protective exposure level that would produce minimal hearing loss: less than 5 dB at 4000 Hz for 96% of the people.

Forty years of exposure (250 working days per year) to a noise level of 73 dB for 8 hours per day was calculated to produce a hearing loss smaller than 5 dB for 96% of the people. This is the basic datum used to calculate hearing-protective levels of noise exposure. To use it in specific situations, certain corrections must be applied. One correction is to determine the yearly (rather than working day) level (250 to 365 days). This consideration amounts to a reduction 1.6 dB. Another correction, based on exposure on a 24-hour rather than 8-hour basis, produces an additional reduction of 5 dB.

Table IV contains at-ear noise exposure levels that produce negligible hearing losses for both 8-hour and 24-hour exposure on a yearly and working day basis. The 8-hour calculation assumes the remaining 16 hours of the day are spent in relative quiet.

Since an individual often experiences intense noise exposure outside of working hours (for example, while using noisy appliances or pursuing noisy recreation), protection on a 24-hour basis 365 days per year requires exposure of an intermittent variety at an equivalent level of less than 71.4 dB. This value is rounded to 70 dB to provide a slight margin of safety. Exposure to greater levels would produce more than 5 dB hearing loss in at least some of the population.

Table IV  
(At-Ear) Exposure Levels that Produce No More Than  
5 dB Noise-Induced Hearing Damage Over a 40-Year Period

		Steady (Continuous) Noise	Intermittent Noise	With Margin of Safety
Leq, 8 hour	250 day/year	73	78	
	365 day/year	71.4	76.4	75
Leq, 24 hour	250 day/year	68	73	
	365 day/year	66.4	71.4	70

#### Discussion of Assumptions

Several assumptions have been made in calculating the 24-hour yearly hearing-protective level of 70 dB. It is reasonable to ask how alternative assumptions would affect this level, and what the range of error might be.

- Q. How would the recommended level be affected by a change in the percentage of the population protected?
- A. Reducing the 96th percentile value to the 50th percentile (i.e., protecting half the population) would increase the protective level value from 70 dB to 77 dB.
- Q. Since agreement on the value of the intermittency correction is imperfect, what other values might be used?
- A. The estimated intermittency correction used in the Levels Document is 5 dB. The true intermittency correction is probably within the range 0 to 15 dB.
- Q. How accurate is the equal energy assumption?
- A. The equal energy assumption when applied to the long times (8 hours to 24, or 250 to 365 days) is fairly accurate. It may be subject to error when applied to short exposures of extreme level.

- Q. How meaningful are the basic studies of hearing damage risk?
- A. The probable errors of estimates in the three basic studies cannot be stated with absolute accuracy. There are a number of problems in extrapolating percentages of the population damaged from relatively high exposure levels to the protective level. Also, there is the problem of determining the amount of hearing damage when the control (non-exposed) population is subject to high levels of non-occupational noise. Thus, the 70 dB protective level is simply the best present estimate, subject to change if better data become available.

**SPEECH COMMUNICATION**

Communication is an essential element of human society, and speech is its most convenient form of expression. Interference with speech can degrade living directly, by disturbing normal social and work-related activities, and indirectly, by causing annoyance and stress. Sometimes the communications disturbed by noise are of vital importance, such as warning signals or cries for assistance. Prolonged speech interference and resulting annoyance are clearly not consistent with public health and welfare.

Speech interference from environmental noise can occur at home, at work, during recreation, inside vehicles, and in many other settings. Of chief concern for current purposes are the effects of noise on face-to-face conversations (indoors and outdoors), telephone conversations, and radio or television use.

The degree to which noise disturbs speech depends not only on physical factors (such as noise levels, vocal effort, distances between talkers and listeners, and room acoustics), but also on non-physical factors. The latter include the speaker's enunciation, the familiarity of the listener with the speaker's vocabulary and accent, the topic of conversation, the listener's motivation, and the hearing acuity of the listener. Years of research on speech intelligibility have produced considerable information about how these factors interact. Accurate predictions of speech intelligibility can be based on average noise levels and distances between speakers and listeners.

**Speech Interference Indoors**

The solid line in Figure 10 shows the effects of steady masking noise on sentence intelligibility for persons with normal hearing in a typical living room. At distances greater than about one meter from the speaker, the level of speech is fairly constant throughout the room.

The highest noise level that permits relaxed conversation with 100% sentence intelligibility throughout the room is 45 dB. People tend to raise their voices when the background noise exceeds 45-50 dB.

**Speech Interference Outdoors**

The sound level of speech outdoors decreases with increasing distance between speaker and listener. Table V shows distances between speaker and listener for satisfactory outdoor speech intelligibility at two levels of vocal effort in steady background noise levels.

The levels for normal and raised-voice "satisfactory conversation" shown in Table V permit sentence intelligibility of 95% at each distance. Ninety-five percent sentence intelligibility usually permits reliable communication because of the redundancy in normal conversation.

If the noise levels in Table V are exceeded, the speaker and listener must either move closer together or expect reduced intelligibility. For example, consider a conversation at normal vocal effort at a distance of three meters in a steady background noise of 56 dB. If the background level increases to 66 dB, the speakers either will have to move closer (to one meter apart) to maintain the same intelligibility, or alternatively, raise their voices appreciably. If they remain three meters apart without raising their voices, speech intelligibility would drop considerably.

Table V  
Steady A-weighted Sound Levels That Allow Communication with  
95 Percent Sentence Intelligibility Over Various Distances  
Outdoors for Different Voice Levels

VOICE LEVEL	COMMUNICATION DISTANCE (meters)					
	0.5	1	2	3	4	5
Normal Voice (dB)	72	66	60	56	54	52
Raised Voice (dB)	78	72	66	62	60	58

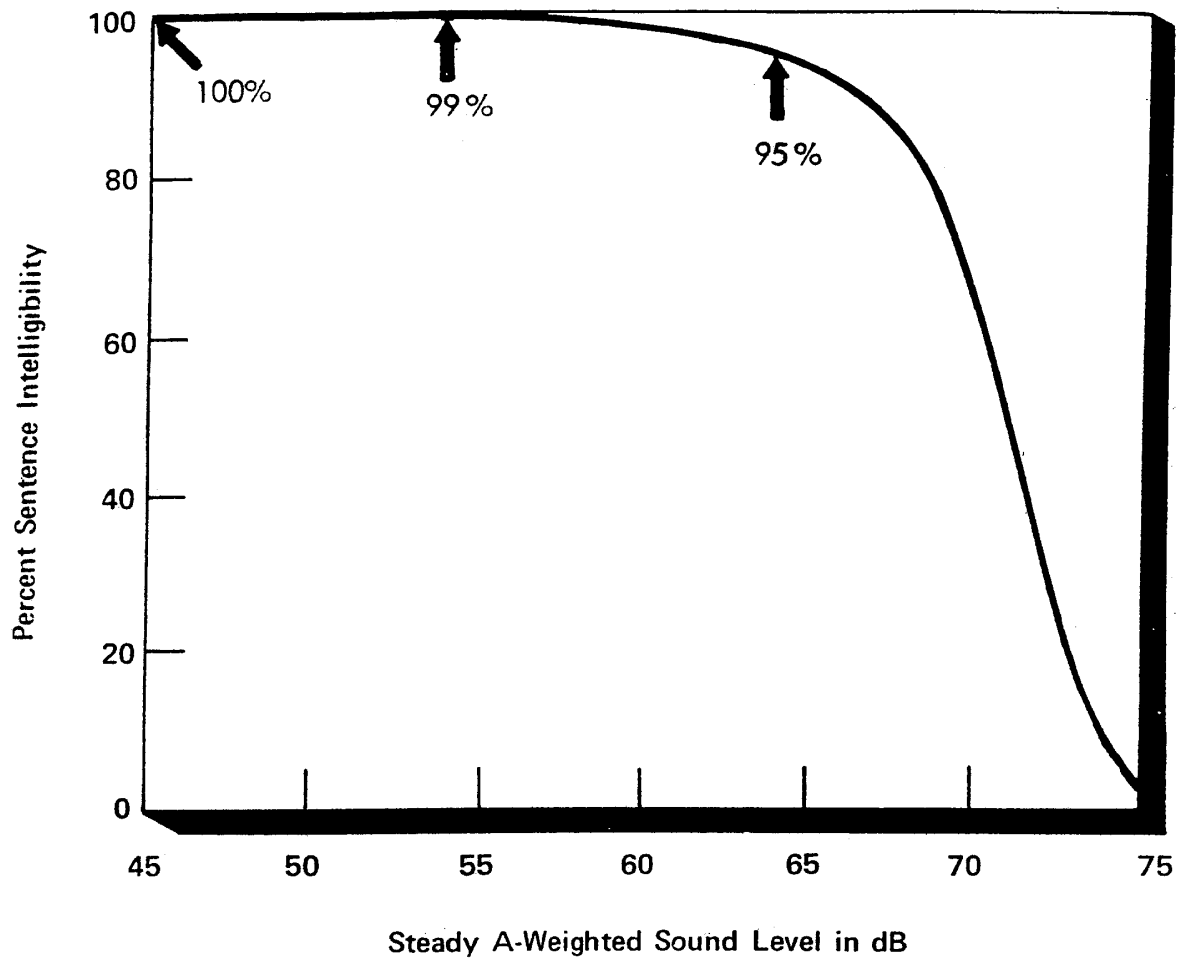


FIGURE 10. INDOOR SENTENCE INTELLIGIBILITY

### Discussion

In summary, an  $L_{dn}$  of 45 dB permits virtually 100% intelligibility inside buildings. Assuming that a typical home reduces outdoor noise by 15 dB, the outdoor noise level should be no greater than  $L_{dn} = 60$  dB to permit 100% intelligible speech indoors. Allowing a 5 dB margin of safety, the outdoor level should be  $L_{dn} = 55$  dB. This outdoor level would also guarantee sentence intelligibility of 95% outdoors with normal voice levels at a distance of three meters.

Q. What do percentages of sentence intelligibility signify?

A. A given percentage of sentence intelligibility, such as 95% or 99%, indicates the proportion of key words (in a group of sentences) which are correctly heard by normal-hearing listeners.

Q. How are the speech criteria affected by the fact that people tend to raise their voices in noise?

A. The speech criteria are based on the principle that an adequate communication environment does not necessitate raised voices.

Q. How do the identified continuous equivalent levels relate to the fact that, in everyday life, noise fluctuates and is intermittent in nature?

A. The Levels Document tabulated speech interferences for different combinations of levels and durations to test the limits of certain  $L_{eq}$  values under intermittent conditions. It is acknowledged that, given equal  $L_{eq}$  values, fluctuating noise may reduce less total speech interference than continuous noise on average. On the other hand, during those times when the higher level noises occur, the speech interference will be greater than its average value.

### ACTIVITY INTERFERENCE AND ANNOYANCE

Noise interferes with human activities to varying degrees. Intruding noises can interfere with human activities by distracting attention and by making activities more difficult to perform, especially when concentration is needed. Interference from noise can even make some activities (such as communication or sleep) virtually impossible. Except in the case of speech interference, however, the degree of interference is hard to specify and difficult to relate to the level of noise exposure.

Because people's reactions to time-varying noise differ from moment to moment, and because people's reactions differ in general, protective levels for annoyance and activity interference are determined from data collected from groups of people, rather than from individuals. Fortunately, considerable data from social surveys of community reactions to noise exposure are available for this purpose. Although there are some shortcomings in practically all such data, sufficient agreement exists to allow confident predictions of the noise levels that lead to certain degrees of activity interference and annoyance.

#### Activity Interference

Social surveys most often have been used to assess community reaction to noise exposure around airports. Table VI shows the percentage of people who reported noise interference with activities among a larger group which was extremely disturbed by aircraft noise.

It is hardly surprising that four of the nine activities in Table VI involve listening. Aircraft noise may also be found annoying because it may startle people, cause houses to shake, or elicit fear of a crash.

Another widely studied source of community noise exposure is vehicular traffic. Activity interference produced by traffic noise closely resembles that of aircraft noise, since interference with conversation, radio, television, and telephone use are all high on the list of activities disturbed.

Table VI  
Percentage of Those People Who Were Highly  
Disturbed by Aircraft Noise, by Activity Disturbed

ACTIVITY	PERCENT
TV-Radio Reception	20.6
Conversation	14.5
Telephone	13.8
Relaxing Outside	12.5
Relaxing Inside	10.7
Listening to Records/Tapes	9.1
Sleep	7.7
Reading	6.3
Eating	3.5

### Community Reactions to Noise

Two major indices of the cumulative effects of environmental noise on people are (A) specific actions taken by individuals or groups (such as complaints), and (B) responses to social survey questionnaires. Over the last 25 years, numerous studies have been conducted to increase understanding of the relationship between noise exposure and its effects on people in communities.

Several factors beyond the magnitude of exposure have been found to influence community reaction. These factors include:

1. Duration of intruding noises and frequency of occurrence
2. Time of year (windows open or closed)
3. Time of day of noise exposure
4. Outdoor noise level in community when intruding noises are not present
5. History of prior exposure to the noise source
6. Attitude toward the noise source
7. Presence of pure tones or impulses.

Since each of these factors may affect community reactions to noise exposure, adjustments for each have been developed to improve the predictability of community reactions beyond that available from a simple measure of exposure level. Figure 11 shows the results of several different case studies, relating  $L_{dn}$  (in dB) to community response with various correction factors added. The addition of the correction factors makes it possible to predict community reaction to within  $\pm 5$  dB. As is common with annoyance and interference caused by noise, the effects of context and situation may be almost as important as the magnitude or intensity of the source. Caution is also needed in applying these relationships to communities that are significantly quieter than average urban areas.

### Social Surveys

Extensive social surveys have been conducted around Heathrow Airport near London and at eight major airports in the United States. The relationship found in these surveys between noise exposure levels and the percentage of respondents who were considered annoyed by noise is summarized in Figure 12.

### Discussion

- Q. Is annoyance simply a "welfare" effect?
- A. Annoyance is a reflection of adverse effects which cannot be ascribed solely to "health" or "welfare." "Public health and welfare" in the context of the Noise Control Act is an indivisible term; there are no separate "health" effects or "welfare" effects. "Public health and welfare" includes personal comfort and well-being, and the absence of mental anguish, disturbances and annoyance as well as the absence of clinical symptoms such as hearing loss or demonstrable physiological injury.
- Q. What is annoyance due to noise?
- A. Noise annoyance may be viewed as any negative subjective reaction to noise on the part of an individual or group. It is not an indication of weakness or inability to cope with stress on the part of the annoyed. More likely it signifies transient (or possibly lasting) stress beyond the control of the conscious individual. This is often expressed on social surveys as the percentage of people who express differing degrees of disturbance or dissatisfaction due to the noisiness of their environments. For the purpose of identifying protective noise levels, annoyance is quantified by using the percentage of people who are annoyed by noise. This is felt to be the best estimate of the average general adverse response of people, and in turn, is viewed as reflecting activity interference and the overall desire for quiet.
- Q. Are people annoyed at levels below an  $L_{dn}$  of 45 or 55 dB?
- A. Individuals, or even groups, may be annoyed by noise at low levels—the dripping faucet or humming fluorescent bulb are good examples. Annoyance depends very much on the situation, and on individual differences and noise durations.
- Q. What do complaints represent?
- A. Complaints are used by officials as an indication that a noise problem exists (although a noise problem may well exist in the absence of specific complaints). However, they do not necessarily represent the magnitude of a noise problem. The number of people who file complaints is only a very small percentage of those who are annoyed.



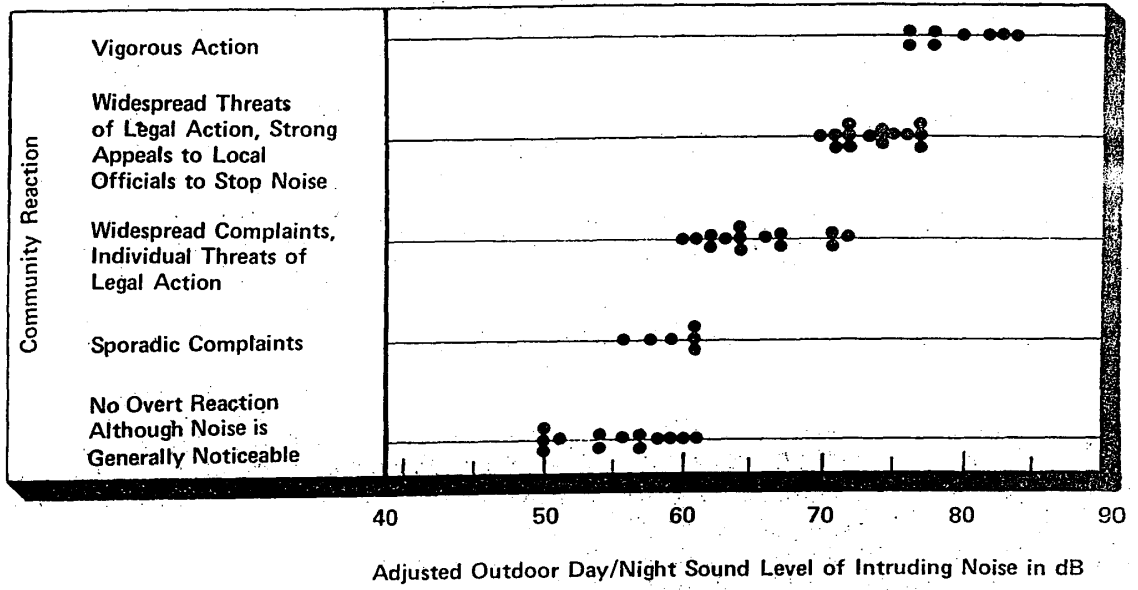


FIGURE 11. COMBINED DATA FROM COMMUNITY CASE STUDIES ADJUSTED FOR CONDITIONS OF EXPOSURE

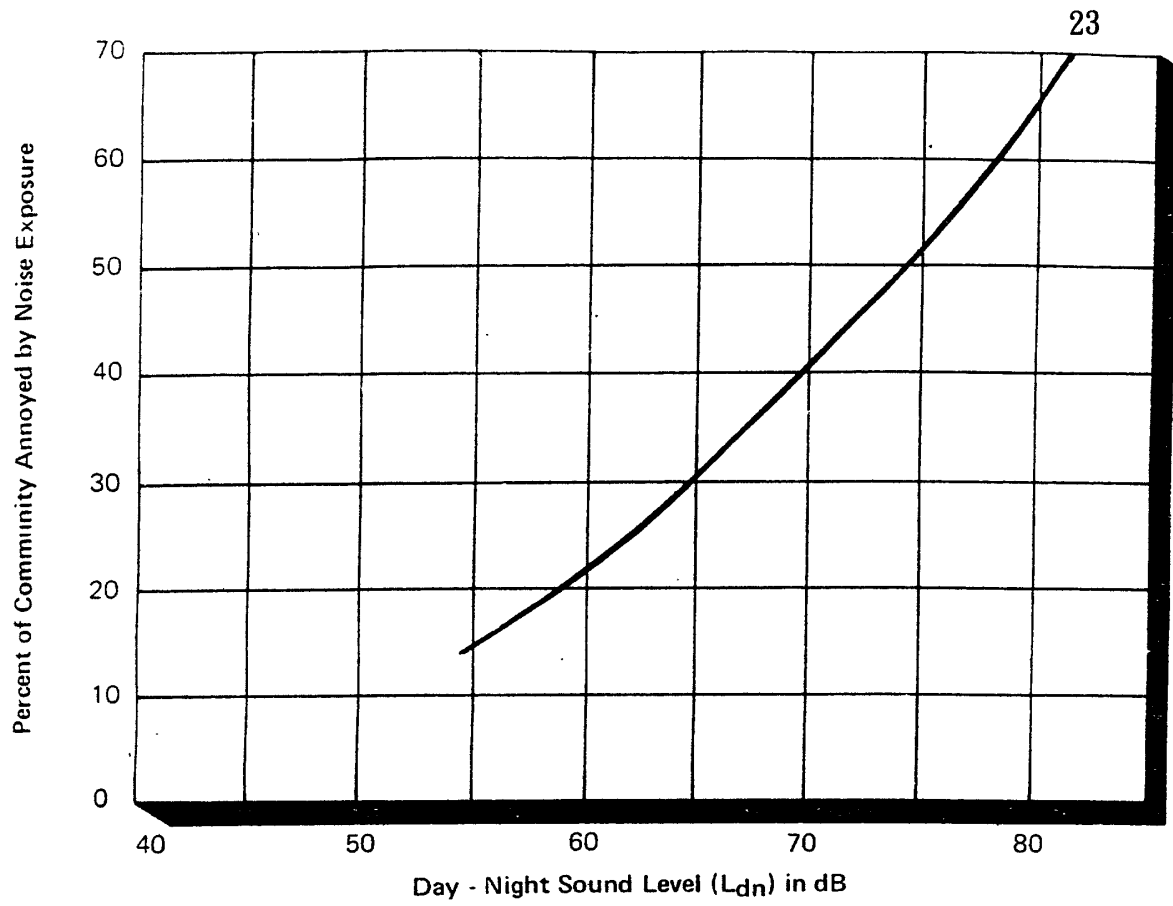


FIGURE 12. PERCENTAGE OF POPULATION ANNOYED BY COMMUNITY NOISE (HEATHROW AIRPORT STUDY)

- Q. How is the margin of safety for annoyance applied?
- A. The identified indoor level of  $L_{dn} = 45$  incorporates a margin of safety for 100% protection of speech perception which is used as a surrogate for annoyance. The outdoor identified level of 55  $L_{dn}$  protects speech outdoors to a level of 95% intelligibility at up to 2 meters, while incorporating a 5 dB margin of safety for speech, and giving added weight to the range of adverse effects.
- Q. Why is the nighttime penalty 10 decibels?
- A. The 10 dB nighttime weighting had two bases: first, this weighting value has been applied successfully here and in other countries; secondly, in quiet environments, the natural drop in level from day to night is about 10 dB.

**SUMMARY**

On the basis of its interpretation of available scientific information, EPA has identified a range of yearly Day-Night Sound Levels sufficient to protect public health and welfare from the effects of environmental noise. It is very important that these noise levels, summarized in Table VIII, not be misconstrued. Since the protective levels were derived without concern for technical or economic feasibility, and contain a margin of safety to insure their protective value, they must not be viewed as standards, criteria, regulations, or goals. Rather, they should be viewed as levels below which there is no reason to suspect that the general population will be at risk from any of the identified effects of noise.

Table VIII  
Yearly  $L_{dn}$  Values That Protect Public Health and Welfare with a Margin of Safety

EFFECT	LEVEL	AREA
Hearing	$L_{eq(24)} \leq 70$ dB	All areas (at the ear)
Outdoor activity interference and annoyance	$L_{dn} \leq 55$ dB	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use.
	$L_{eq(24)} \leq 55$ dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	$L_{dn} \leq 45$ dB	Indoor residential areas
	$L_{eq(24)} \leq 45$ dB	Other indoor areas with human activities such as schools, etc.

Outdoor yearly levels on the  $L_{dn}$  scale are sufficient to protect public health and welfare if they do not exceed 55 dB in sensitive areas (residences, schools, and hospitals). Inside buildings, yearly levels on the  $L_{dn}$  scale are sufficient to protect public health and welfare if they do not exceed 45 dB. Maintaining 55  $L_{dn}$  outdoors should ensure adequate protection for indoor living. To protect against hearing damage, one's 24-hour noise exposure at the ear should not exceed 70 dB.

**MISUSES, MISUNDERSTANDINGS, AND QUESTIONS**

Perhaps the most fundamental misuse of the Levels Document is treatment of the identified levels as regulatory goals. They are *not* regulatory goals; they are levels defined by a negotiated scientific consensus. These levels were developed without concern for economic and technological feasibility, are intentionally conservative to protect the most sensitive portion of the American population, and include an additional margin of safety. In short, the levels in Table VIII are neither more nor less than what Congress re-

quired them to be: levels of environmental noise requisite to protect the public health and welfare with an adequate margin of safety.

- Q. Why doesn't the Levels Document explicitly say how much noise is too much noise?
- A. Decisions about how much noise is too much noise for whom, for how long, and under what conditions demand consideration of economic, political, and technological matters far beyond the intent of the Levels Document. Such decisions are properly embodied in formal regulations, not informational publications such as the Levels Document.
- Q. How do I use this information for local purposes?
- A. This question reflects the need to reconcile local economic and political realities with scientific information. People who formulate local noise abatement programs cannot escape the responsibility of making such economic and political compromises for their constituencies. The Levels Document does not impose arbitrary Federal decisions about the appropriateness of noise environments upon any level of government, nor is it a source of prescriptions for solving local noise problems. It is best viewed as a technical aid to local decision makers who seek to balance scientific information about effects of noise on people with other considerations, such as cost and technical feasibility.
- Q. If the identified noise levels are indeed sufficient to protect public health and welfare, shouldn't they be considered to be long-range regulatory goals?
- A. Attainment of the identified levels of environmental noise can only be considered idealized goals. Pragmatically, it is unlikely that local, state, or Federal regulatory strategies will seek to attain such levels for all situations in the near future.
- Q. Why isn't the Levels Document more definite about specific effects associated with various noise exposure conditions?
- A. Available knowledge about the effects of noise would not support more precise statements. Increasingly specific statements will be incorporated in future informational publications as they are justified by increasing knowledge of human response to noise exposure.

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		14. SPONSORING AGENCY CODE EPA/ONAC
15. SUPPLEMENTARY NOTES		
16. ABSTRACT  This publication is intended to promote understanding of EPA's findings about levels of environmental noise that protect public health and welfare. It seeks to clarify the proper use of the 1974 "Levels Document" by interpreting its contents in less technical terms. The manual deals with measurement descriptors of environmental noise. Also addressed are the best understood effects of noise on people (hearing damage, speech interference and annoyance). Protective levels are summarized.		
17. KEY WORDS AND DOCUMENT ANALYSIS		
a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Environmental noise levels, indoor and outdoor levels, measurement descriptors, noise exposure patterns, hearing damage, speech interference, annoyance, protective noise exposures		
18. DISTRIBUTION STATEMENT Limited supply available at EPA/ONAC or NTIS, Springfield, VA 22151	19. SECURITY CLASS (This Report) Unclassified	21. NO. OF PAGES 25
	20. SECURITY CLASS (This page)	22. PRICE

**UNITED STATES  
ENVIRONMENTAL PROTECTION AGENCY**

**BIBLIOGRAPHY**  
OF  
**NOISE PUBLICATIONS**

1972-1982



## INTRODUCTION

The EPA Noise Publications listed in this Bibliography are a composite of all materials developed and made available to the public from 1972 when EPA's Office of Noise Abatement and Control was established through 1982 when the Noise Program was phased out and the responsibility for Noise Abatement and Control was delegated back to State and local governments.

The publications are listed in reverse chronological order with 1982 publications listed first.

The EPA Document Control Number is made up as follows:

550/9	Code for Office of Noise Abatement and Control
-82	Publication Year
-400	State and Local Category

From 1976 through 1982 the EPA Document Control Number indicates the four major categories of subject areas as follows:

Health and Welfare - 100 series
Standards and Regulations - 200 series
Technical and Federal Programs - 300 series
State and Local Programs - 400 series

In some instances, a document is not available from NTIS and another source is given. Names, addresses and telephone numbers of these sources are listed on the following page.

An asterisk indicates the publication is only available on loan from U.S. Environmental Protection Agency, Headquarters Library, OANR, Washington, D.C. 20460.



ASA  
Acoustical Society of America  
335 East 45th Street  
New York, New York 10017  
(212) 661-9494

FAA  
Federal Aviation Administration  
Department of Transportation  
800 Independence Avenue, S.W.  
Washington, D.C. 20591  
(202) 75-9027

FR  
Federal Register  
National Archives and Records Service  
Washington, D.C. 20408  
(202) 523-5240

GPO  
Government Printing Office  
Superintendent of Documents  
Washington, D.C. 20402  
(202) 783-3238

NANCO  
National Association of Noise Control Officials  
Post Office Box 2618  
Fort Walton Beach, Florida 32549  
(904) 243-8129

NBS  
National Bureau of Standards  
Department of Commerce  
Washington, D.C. 20234  
(202) 921-2495

NTIS  
National Technical Information Service  
Department of Commerce  
5285 Port Royal Road  
Springfield, Virginia 22161  
(703) 487-4650

Office of Naval Research  
Ballston Center Tower  
800 North Quincy Street  
Arlington, Virginia 22217  
(703) 696-4609

QUIET SCHOOL PROGRAM MATERIALS

Public education materials developed by ONAC can be purchased through the Education Resources Information Center (ERIC) system as follows:

PREPARING FOR A QUIETER TOMORROW  
A teaching unit for junior and senior high school students  
ED-201 508

SOUNDS ALIVE: A NOISE WORKBOOK  
Developed for kindergarten and elementary grades  
ED-201 509

SOUNDS ALIVE: A TEACHER'S GUIDE FOR THE NOISE WORKBOOK  
ED-201 510

COST:

Microfiche	\$0.91 per copy plus 20¢ postage
Paper copy	\$6.95 for the first copy plus \$1.84 UPS \$3.65 each additional copy plus \$1.47 UPS

MAILING ADDRESS:

E.R.I.C. DOCUMENT REPRO SERVICES  
P.O. BOX 190  
ARLINGTON VIRGINIA 22210  
(703) 841-1212

\* \* \*

SCHOOL POSTERS "NOISE AND YOUR HEARING" AND "HEAR, HERE", (coloring and quiz books), please contact:

AMERICAN SPEECH AND HEARING ASSOCIATION  
Attention: Public Information  
10801 ROCKVILLE PIKE  
ROCKVILLE, MARYLAND 20852

\* \* \*



<u>TITLE</u>	<u>EPA NUMBER</u>	<u>NTIS PUBLICATION NO.</u>
MEASUREMENTS OF THE IMPULSIVENESS & ANNOYANCE OF COMPRESSION RELEASE ENGINE BRAKE NOISE	550/9-82-100	PB82-153180

The research described in this report was undertaken to evaluate the potential contribution to the overall annoyance of heavy truck noise of the impulsive character of exhaust noise created by engine compression-release braking devices. Although growing numbers of trucks are likely to be equipped with these safety devices in the future, current methods for assessing health and welfare effects of traffic noise on residential populations make no specific provisions for annoyance associated with impulsive noise sources.

FIVE YEAR PLAN FOR EFFECTS OF NOISE ON HEALTH	550/9-82-101	PB82-168972
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This plan is intended to serve as a blue print for future research by other organizations. It includes detailed plans across all the health effects categories such as nonauditory physiologic effects, behavioral effects and noise-induced hearing loss, to name just a few.

ASSESSMENT OF THE APPLICABILITY OF EXISTING HEALTH & WELFARE CRITERIA TO GENERAL AVIATION AIRCRAFT NOISE & TO GENERAL AVIATION AIRPORT COMMUNITIES (FINAL REPORT)	550/9-82-102	PB82-180134
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Existing metrics of environmental noise and its impact on people are reviewed for their suitability in assessing the impact of general aviation (GA) noise on people in airport communities.

ANALYSIS OF NOISE RELATED AUDITORY & ASSOCIATED HEALTH PROBLEMS IN THE U.S. ADULT POPULATION (1971-1975)	550/9-82-103A 550/9-82-103B	PB82-218629 PB82-218637
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Analyses presented in this report are based on the national probability subsample of 6913 adults aged 25-74 who were administered an audiometric test as well as detailed questionnaires and physical examinations dealing with hypertension and a variety of other health conditions.

<u>TITLE</u>	<u>EPA NUMBER</u>	<u>NTIS PUBLICATION NO.</u>
GUIDELINES FOR NOISE IMPACT ANALYSIS	550/9-82-105	PB82-219205
<p>The purpose of the guidelines proposed in this report is to provide with analytic procedures which can be uniformly used to express and quantify impacts from noise. The quantification methods recommended for impact assessment in these guidelines are further developments of the Fractional Impact Methodology used for assessing the health and welfare effects of a noise environment. Three principal types of noise and vibration environments are considered: general audible noise, special noises; and vibration.</p>		
NOISE EFFECTS HANDBOOK - A DESK REFERENCE TO HEALTH AND WELFARE EFFECTS OF NOISE	550/9-82-106	PB82-243981
<p>The desk reference contains up-to-date scientific information on the health effects of noise in a "Question and Answer" format, designed for technical or semi-technical audiences, such as State and local officials or the general public.</p>		
HUSH PROGRAM (BARRIER COMPONENT) GUIDANCE MATERIAL	550/9-82-150	PB82-253535
<p>Topics addressed include a brief description of the nation's growing highway noise problem, the effects of noise on health and welfare and how to reduce noise exposures in the proximity of highways. Easy methods of identifying noise-hotspots are discussed and methods to obtain relief are elaborated upon.</p> <p>Noise barriers as a possible solution are stressed and guidance is given to initiate action. In addition, case histories and specific technical details are presented to assist those in charge of planning and constructing barriers.</p> <p>This study was prepared for people suffering from noise, concerned citizens, technical and non-technical state, local and Federal officials involved in the process of solving severe noise problems along interstate highways, as well as planners wishing to avoid high noise exposures through planning.</p>		
SUBSTRATEGY FOR CONSTRUCTION SITE NOISE ABATEMENT	550/9-82-151	PB82-218579
<p>This study outlines a national strategy to address construction site-noise. After explaining the peculiar nature of construction-site noise and estimating the population exposed to high noise levels, the author presents viable methods to control such noise.</p>		

<u>TITLE</u>	<u>EPA NUMBER</u>	<u>NTIS PUBLICATION NO.</u>
BENEFIT/COST ANALYSIS FOR STATE & LOCAL NOISE CONTROL PROGRAMS PHASE II - Report In-Use Controls of Motor Vehicle with Degraded Mufflers and Regulations Scenarios	550/9-82-152	PB82-213919

This study projects the noise exposure of the U.S. population from motor vehicles to the Year 2000 and indicates the reduction of such exposures from various new product regulations compared with in-use enforcement programs that concentrate on the removal of a portion of defective motor vehicle exhausts. Along with the benefits, the potential costs of various controls are projected for comparison purposes.

NATIONAL ROADWAY TRAFFIC NOISE EXPOSURE MODEL (NRTNEM)	550/9-82-201-A	PB82-259037
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The National Roadway Traffic Noise Exposure Model (NRTNEM) is comprised of a collection of on-line datasets, some containing programs and others containing data. The manual describes the job submission procedures required to run the NRTNEM as it existed on the NCC (EPA's National Computer Center) in December, 1981, under user ID EPADYN.

The NRTNEM actually consists of two models: The General Adverse Response Model ("GAR"), and the Single Event Model ("SEM"). Only one of them can be executed by a job at a time.

The NRTNEM was designed for and runs on an IBM/370 computer under MVS, with TSO (the Time Sharing Option) and WYLBUR, the latter two being conversational direct-access systems.

NATIONAL ROADWAY TRAFFIC NOISE EXPOSURE MODEL (NRTNEM) - PROGRAMMER'S MANUAL	550/9-82-201-B	PB82-259045
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The Programmer's Manual describes the NRTNEM system described above in more detail to facilitate program maintenance.

RAILYARD NOISE EXPOSURE MODEL (RYNEM) - Volume 1: Description of RYNEM Model	550/9-82-202-A	PB82-254723
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This volume presents an overview of the RYNEM model. The basic philosophy of the model is discussed and the relevant equations used in the computations are presented. This volume is written for those who need to know what the model is like. It does not go into detail of how each computation is done in the program, nor does it teach the user how to run the model. The reader is advised to peruse the Railroad Background document for other terminology used without explanation.

<u>TITLE</u>	<u>EPA NUMBER</u>	<u>NTIS PUBLICATION NO.</u>
RAILROAD NOISE EXPOSURE MODEL (RYNEM) VOLUME II - RYNEM USER MANUAL	550/9-82-202-B	PB82-254731

This volume presents a cookbook approach to the execution of the RYNEM model. Its intended audience is those who will exercise the model. It assumes familiarity with Volume I, i.e., the user knows the quantities he inputs, and he knows the quantities printed out. For obvious reasons, the explanations incorporated in Volume I are not repeated. While it does not presume expertise with the EPA IBM computer system, it does assume the user can follow the instructions presented in this volume to the letter.

RAILROAD NOISE EXPOSURE MODEL (RYNEM) VOLUME III - RYNEM PROGRAMMING MANUAL	550/9-82-202-C	PB82-254749
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This volume describes the structure of the RYNEM and the model's program source code. It is not meant to teach the reader how to run the program. Execution of the model is described in Volume II. It assumes the reader has digested the contents of Volume I. The intended audience is the programmer who needs to maintain the program and make changes to the source code. A strong knowledge of standard IBM FORTRAN IV language is assumed.

RAILYARD NOISE EXPOSURE MODEL SOURCE SUBMODEL (RYNEM-S) VOLUME I - Description of RYNEM-S Model	550/9-82-203-A	PB82-259060
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This volume presents an overview of the RYNEM-S model. The basic philosophy of the model is discussed and the relevant equations used in the computations are presented. This volume is written for those who need to know what the model is like. It does not go into detail of how each computation is done in the program, nor does it teach the user how to run the model. It presupposes some familiarity with the EPA noise terminology, as is covered by the "EPA Levels" document. The reader is advised to peruse the Railroad Background document for other terminology used without explanation.

RAILYARD NOISE EXPOSURE MODEL SOURCE SUBMODEL (RYNEM-S) VOLUME II - RYNEM-S USERS MANUAL	550/9-82-203-B	PB82-259078
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This volume presents a cookbook approach to the execution of the RYNEM-S model. Its intended audience is those who will exercise the model. It assumes familiarity with Volume I, i.e., the user knows the quantities he inputs, and he knows the quantities printed out. For obvious reasons, the explanations incorporated in Volume I are repeated. While it does not presume expertise with the EPA IBM computer system, it does assume the user can follow the instructions presented in this volume.

<u>TITLE</u>	<u>EPA NUMBER</u>	<u>NTIS PUBLICATION NO.</u>
RAILYARD NOISE EXPOSURE MODEL SOURCE SUBMODEL (RYNEM-S) VOLUME III - RYNEM-S PROGRAMMER MANUAL	550/9-82-203-C	PB82-259086

This volume describes the structure of the RYNEM-S and the model's program source code. It is not meant to teach the reader how to run the program. Execution of the model is described in Volume II. It assumes the reader has digested the contents of Volume I. The intended audience is the programmer who needs to maintain the program and make changes to the source code. A strong knowledge of standard IBM FORTRAN IV language is assumed.

RAILROAD CASH FLOW MODEL SOFTWARE DOCUMENTATION VOLUME I Cash Flow Model Description	550/9-82-204-A	PB82-259102
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This document describes the cash flow model used in the financial analysis conducted for the background document to railroad yard noise standards. It first details the purpose of the cash flow model. Next, a derivative to the equations used in the model is presented. Volume II lists the data inputs needed to use the model. Finally, a sample output of the model is shown with notes on how to interpret it.

RAILROAD CASH FLOW MODEL SOFTWARE DOCUMENTATION VOLUME II Cash Flow Model Users Guide	550/9-82-204-B	PB82-259110
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This volume of the railroad cash flow software documentation describes the use of the railroad cash flow model. It tells how to access the model and how to change the data. Section 2.1 provides a brief overview of the design of the cash flow model and the computing environment it is used in. Section 2.2 describes how to access the computer and run the model. Section 2.3 shows how to change the data. Section 2.4 is a sample output. Appendix A is a sample session with the cash flow model. Appendix B is a list of key commands which can be used on the WYLBUR system. Appendix C explains how to restore files which have been archived.

RAILROAD CASH FLOW MODEL SOFTWARE DOCUMENTATION VOLUME III Cash Flow Model Programmers Manual	550/9-82-204-C	PB82-259128
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This manual provides information on how to service the cash flow model. It is written for a user who has some familiarity with standard IBM FORTRAN-IV and the WYLBUR system.

The manual has four sections. The first section discusses the model design through its technical specifications, data requirements and algorithms. The second section defines the data base specifications and defines the data names. The third section is an annotated listing of the program. The fourth section describes verification and test procedures for the model.



<u>TITLE</u>	<u>EPA NUMBER</u>	NTIS <u>PUBLICATION NO.</u>
AIRPORT NOISE LITIGATION-CASE LAW REVIEW (1973-1980)	550/9-82-326	PB82-162066

This report examines the judicial trends in airport noise litigation by analyzing the decisions from many of the relevant legal cases. The significant issues arising out of these various cases examine this conflict from four viewpoints: 1) who is liable for aircraft noise related damages? 2) what is the scope of airport use restrictions? 3) what are the legal theories and trends in awarding aircraft noise-related damages? 4) what is the effect of land use planning and environmental impact statements on airport control? This extensive case law review indicates that the courts are continuing to hold the airport proprietor liable for aircraft noise-related damages. The judiciary is also expanding the legal theories and granting recovery for noise-related effects on people under the nuisance theory of emotional distress as well as under the traditional inverse condemnation theory for deprivation of property.

PROCEDURES TO ESTIMATE AIRPORT RESIDENTIAL RELOCATION COSTS	550/9-82-327	PB82-239641
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The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 is reviewed. Procedures are provided for: (1) developing a well-defined set of cases for which relocation costs may be estimated; (2) determining the costs in current dollars for each expense item in each relocation case; and (3) determining the frequency of occurrence for each case as applied to specific airports. Total costs for all cases for a hypothetical airport relocation effort are provided. Supporting data and equations used are presented.

A STUDY OF SOUNDPROOFING REQUIREMENTS FOR RESIDENCES ADJACENT TO COMMERCIAL AIRPORTS	550/9-82-328	PB82-250168
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This study was conducted to estimate the costs of soundproofing dwellings within the  $L_{dn}$  65 noise contours at major U.S. commercial airports. To determine the distribution of dwelling types in each region, and to obtain detailed information on local dwelling characteristics that affect noise reduction, field surveys were conducted at one airport in each region. The airports surveyed were selected on the basis that the local dwelling characteristics were representative of the respective region. The information obtained was used to identify the types of modifications most suitable for soundproofing dwellings in each region.

<u>TITLE</u>	<u>EPA NUMBER</u>	<u>NTIS PUBLICATION NO.</u>
AIRCRAFT FLIGHT PROCEDURES PROGRAM MODIFIED COMPUTER PROGRAM MODEL-USERS MANUAL	550/9-82-329	PB82-183-757

This manual describes an aircraft flight procedures model used to construct aircraft flight paths and performance schedules for specified operational procedures. The computer model algorithms were derived from fundamental aircraft and engine performance relationships or from operational characteristics applicable to specific aircraft types.

AIRCRAFT FLIGHT PROCEDURES PROGRAM: DATA BASE DEVELOPMENT	550/9-82-330 Mag. Tape	PB82-183740 PB82-186172
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The purpose of this study was to identify and collect performance and operational data and information required to construct flight paths and performance schedules for selected commercial aircarrier aircraft types. The information can be used to determine the flight paths and performance schedules for aircraft operating in accordance with specified flight procedures.

DEMONSTRATION TRUCK PROGRAM SUMMARY: TRUCK NOISE REDUCTION	550/9-82-331-A	PB82-220328
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This report presents a comprehensive overview of an EPA-sponsored program to demonstrate the technology and costs of reducing the noise of four heavy-duty diesel trucks to 72 dBA. The program comprised engineering development and service evaluation phases. Noise control treatments were developed and installed on each truck to reduce its noise to the target level. The treatments included partial engine and transmission enclosures, exhaust silencing systems, and two-stage engine mounts for 2 of the 4 trucks. Three trucks entered fleet service where they accumulated 230,000 miles. The treatments proved to be durable and effective and did not have an adverse impact on the operation of any vehicle. Maintenance labor time increased by 1.4% because of the need to remove enclosure panels while performing some maintenance procedures.

<u>TITLE</u>	<u>EPA NUMBER</u>	<u>NTIS PUBLICATION NO.</u>
DEMONSTRATION TRUCK PROGRAM: NOISE REDUCTION, TECHNOLOGY & COSTS FOR A FORD CLT 9000 HEAVY DUTY DIESEL TRUCK	550/9-82-331-B	PB82-220336

This report discusses the technology and costs required to reduce the noise of a Ford CLT 9000 heavy-duty diesel truck from 77.1 to 72.3 dBA. The noise control treatment consists primarily of a dual exhaust silencing system and a partial enclosure for the engine and transmission. Wind tunnel tests on the completed truck show that temperatures of engine coolant and oil remain within manufacturer's specified limits. The noise treatment increases the vehicle weight by 397 lb and estimated vehicle price by \$1309.

DEMONSTRATION TRUCK PROGRAM: NOISE REDUCTION, TECHNOLOGY & COSTS FOR A GENERAL MOTORS BRIGADIER HEAVEY-DUTY DIESEL TRUCK	550/9-82-331-C	PB82-220344
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This report discussess the technology and costs required to reduce the noise of a General Motors Brigadier heavy-duty diesel truck from 81.7 to 71.6 dBA. The noise control treatment consists primarily of a dual exhaust silencing system and a partial enclosure for the engine and transmission. The noise treatment increases vehicle weight by 340 lb and estimated vehicle price by \$1174. Wind tunnel tests on the completed truck show that temperatures of engine coolant and oil remain within manufacturer's specified limites.

DEMONSTRATION TRUCK PROGRAM: NOISE REDUCTION, TECHNOLOGY & COSTS FOR AN INTER-NATIONAL HARVESTER F-4370 HEAVY-DUTY DIESEL TRUCK	550/9-82-331-D	PB82-2220351
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This report discusses the technology and costs required to reduce the noise of an International Harvester F-4370 heavy-duty diesel truck from 81.1 to 72.2 dBA. The noise control treatment consists primarily of a dual exhaust silencing system and a partial enclosure for the engine and transmission. The noise treatment increases the vehicle weight by 332 lb and estimated vehicle price by \$1302. Wind tunnel tests on the completed truck show that temperatures of engine coolant and oil remain within generally acceptable limits.

<u>TITLE</u>	<u>EPA NUMBER</u>	<u>NTIS PUBLICATION NO.</u>
DEMONSTRATION TRUCK PROGRAM: NOISE REDUCTION, TECHNOLOGY & COSTS FOR MACK R686 HEAVY-DUTY DIESEL TRUCK	550/9-82-331-E	PB82-220369

This report discusses the technology and costs required to reduce the noise of a Mack R686 heavy-duty diesel truck from 81.6 dBA to 73.2 dBA. The noise control treatments consist primarily of a partial enclosure for the engine and transmission, an exhaust silencing system, and two-stage engine mounts. These treatments increase the vehicle weight by 398 lb and estimated vehicle price by \$1296.

DEMONSTRATION TRUCK PROGRAM: FIELD TEST OF A QUIETED FORD CLT 9000 HEAVY- DUTY DIESEL TRUCK	550/9-82-331-F	PB82-220377
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This report describes the field test and operational performance evaluation of a quieted Ford CLT 9000 heavy-duty diesel truck. The noise of the truck had been reduced from 77.1 dBA to 72.3 dBA. The field test showed the noise control treatments to be effective and durable in over 100,000 miles of service. The treatments had no adverse impact on the vehicle's operation and appear to have had negligible effect on fuel consumption. Incremental maintenance time of 2.5 hours was attributable to the treatments' impact on normal annual vehicle maintenance.

DEMONSTRATION TRUCK PROGRAM: FIELD TEST OF A QUIETED GENERAL MOTORS BRIGAD- IER HEAVY-DUTY DIESEL TRUCK	550/9-82-331-G	PB82-220385
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This report describes the field test and operational performance evaluation of a quieted General Motors Brigadier heavy-duty diesel truck. The noise of the truck had been reduced from 81.7 dBA to 71.6 dBA. The 12-month field test showed the noise control treatments to be effective and durable, although the noise level of the truck did increase slightly. The treatments did not have an adverse impact on vehicle operation and there was no evidence of payload displacement. The vehicle's fuel economy was better than that of comparison vehicles, but this was not caused by the noise treatments. Incremental maintenance time of 2.25 hours was attributable to treatment removal and interference while performing regular maintenance during the 12-month period.

<u>TITLE</u>	<u>EPA NUMBER</u>	<u>NTIS PUBLICATION NO.</u>
DEMONSTRATION TRUCK PROGRAM: FIELD TEST OF A QUIETED INTERNATIONAL HARVESTER F-4370 HEAVY-DUTY DIESEL TRUCK	550/9-82-331-H	PB82-220351

This report describes the field test and operational performance evaluation of a quieted International Harvester F-4370 heavy-duty diesel truck. The noise of the truck had been reduced from 81.1 dBA to 72.7 dBA. The truck accumulated 36,000 miles in 5 months of service. The treatments were effective and durable, and the noise level of the truck did not increase. The treatments did not have an adverse impact on vehicle operations and there was no evidence that the weight of the treatments displaced payload. The treatments did not have a measurable effect on fuel consumption. The treatments had a minimal impact on maintenance time.

EVALUATION OF A SIMULATED ROAD TEXTURE FOR THE TESTING OF TIRE/ROAD NOISE	550/9-82-332	PB82-250127
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As part of a project to study tire/road, a laboratory roadwheel facility was equipped with replica road surfaces. Moving tests on a flat steel surface were also made. This document compares results from real and simulated surfaces.

THEORETICAL MODELS FOR TIRE/ROAD NOISE EXPERIMENTAL EVALUATION & DOCUMENTATION	550/9-82-333	**
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As part of a program to develop engineering design tools suitable for the development of quiet tires, a set of theoretical noise models was prepared and evaluated. Near-field noise and vibration measurements were made on a roadwheel facility equipped with simulated road surfaces. Data were also collected on a smooth steel roadwheel, so as to separate tread pattern and pavement texture-associated components. Stationary vibration tests, with electrodynamic shaker input, were performed to obtain response of the tire. Contact patch pressure distributions, required for the noise models, were obtained with an array of miniature transducers. The evaluations lead to the refinement of the noise models. Based on these refinements, the models were finalized and computer programs prepared.

METHODS TO REDUCE DIESEL ENGINE NOISE	550/9-82-334	PB82-247925
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This report reviews the state-of-the-art for diesel engine noise reduction and presents new techniques for reducing engine block vibration and radiated noise. It presents a technique which makes it possible to identify and rank order the sources of noise within the engine.

附件二：加州奧克蘭噪音污染管制-

Noise Abatement Program

# Noise Abatement Program

## What is a Noise Violation?

A noise violation occurs when decible levels from a fixed or transient noise source exceed the standards outlined below. Fixed noises are measured objectively with a noise meter. Transient noises are measured subjectively. However, meters are used whenever possible.

Complaints are recorded and responded to by calling the Community and Economic Development Agency's 24-hour noise hotline at 238-6777. Excessive noises occurring within parks are addressed by City of Oakland, Life Enrichment Agency's Office of Parks and Recreation, and by Park Rangers. They can be reached by calling the number listed above.

## Decibel Guide (for fixed noises only)

Residential and Civic Noise Standards		Maximum Allowable	
Cumulative number of minutes in daytime or nighttime within a one hour time period, as received from the property line.	20 Min.	Daytime	Nighttime
		7 a.m. to 10 p.m.	10 p.m. to 7 a.m.
	20 Min.	60 dBA	45
	10	65	50
	5	70	55
	1	75	60
	0	80	65
Commercial Uses			
	20 Min.	Anytime	
	10	65 dBA	
	5	70	
	1	75	
	0	80	
	0	85	
Manufacturing Agricultural and Extractive Noise Levels			
	20 Min.	Anytime	
	10	70 dBA	
	5	75	
	1	80	
	0	85	
	0	90	



CITY OF OAKLAND

Prepared by:

**Community and Economic Development Agency (CEDA)**  
 1330 Broadway, 6th Floor  
 Oakland, CA 94612  
 (510) 238-6777

### **WHAT IS NOISE?**

Noise, or unwanted sound, is a fluctuation in atmospheric pressure caused by sound waves moving through the air (like the ripples that fan out from a pebble dropped in a pond). The intensity of sound is measured as a decibel. Decibel scales range from 0-140 and are measured logarithmically, for example, while 70dBA is physically 10 times as intense as 60dBA, listeners will judge it as twice as loud. The decibel level at which noise becomes unbearable ranges from 80 to 90dBA, like standing next to a vacuum cleaner or food blender that is in operation.

**Transient** noise is generated from a temporary or mobile source (such as a loud party, loud music, a barking dog, or an activated alarm). Transient noises are covered in the Oakland Municipal Code Section 3-1.01, Excessive and Annoying Noises Prohibited, and Section 6-3.32, Park Noise Regulation, and the California Vehicle Code. The Oakland Police Department is responsible for abating these noise sources.

**Fixed** noise refers to noise generated from permanent sources [air conditioning units or mechanical equipment within a property (except burglar alarms)]. Fixed noises are addressed in the Oakland Planning Code and are enforced by the Code Enforcement Division.

### **HOW IS NOISE MEASURED?**

Objectively, Noise can be measured through the use of a noise meter. Sound is measured in decibels (dBA) and takes into account ambient or background noise. Fixed noise is easily measured with a meter and the recording officer can determine if the activity is in violation.

Subjectively, Transient noise is not measured scientifically. A violation is determined at the discretion of the recording officer. The noise meter is a tool available to a recording officer to assist in the determination of a violation to Oakland's noise standards.



## WHAT IS NOISE?

Noise, or unwanted sound, is a fluctuation in atmospheric pressure caused by sound waves moving through the air (like the ripples that fan out from a pebble dropped in a pond). The intensity of sound is measured as a decibel. Decibel scales range from 0-140 and are measured logarithmically for example, while 70dBA is physically 10 times as intense as 60dBA, listeners will judge it as twice as loud. The decibel level at which noise becomes unbearable ranges from 80 to 90dBA, like standing next to a vacuum cleaner or food blender that is in operation.

*Transient* noise is generated from a temporary or mobile source (such as a loud party, loud music, a barking dog, or an activated alarm). Transient noises are covered in the Oakland Municipal Code Section 3-1.01, Excessive and Annoying Noises Prohibited, and Section 6-3.32, Park Noise Regulation, and the California Vehicle Code. The Oakland Police Department is responsible for abating these noise sources.

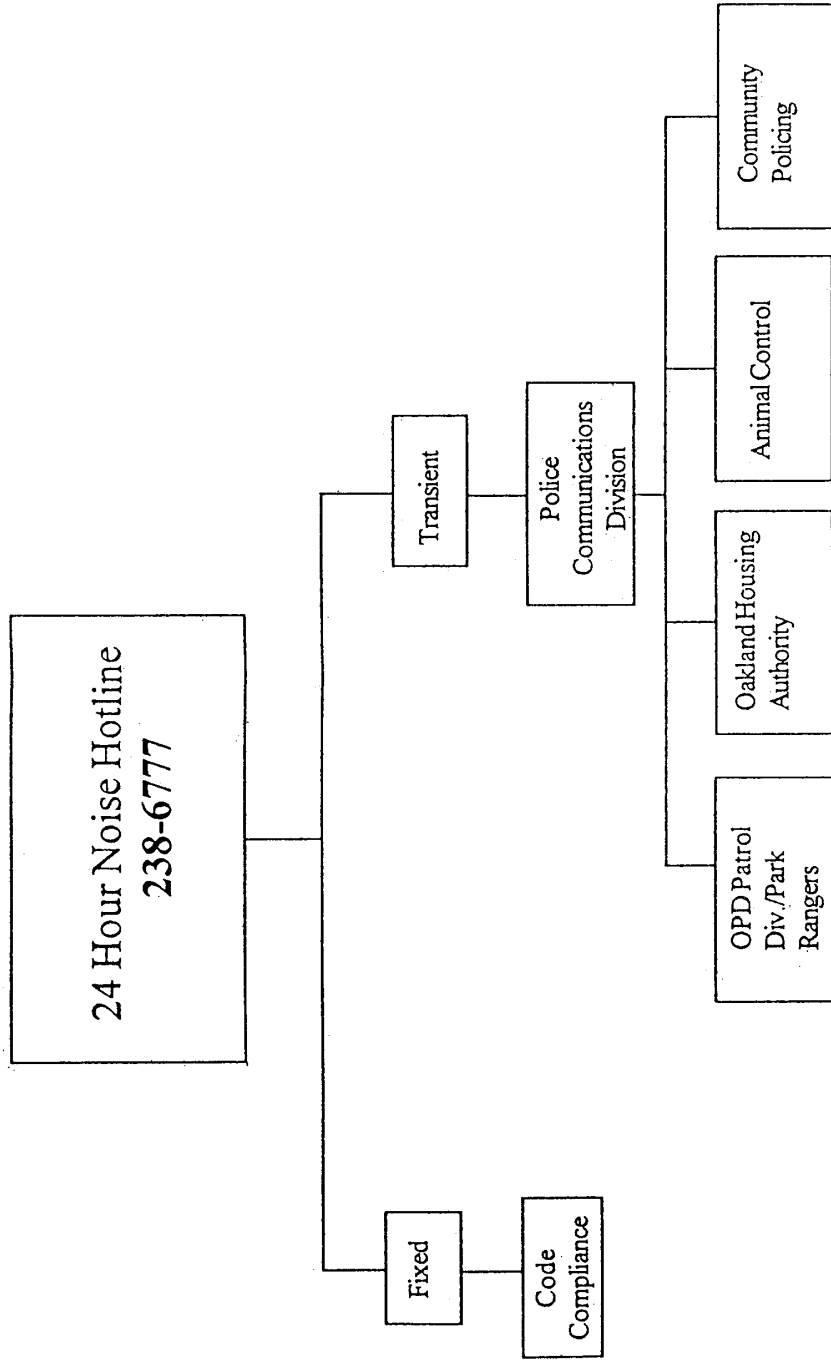
*Fixed* noise refers to noise generated from permanent sources [air conditioning units or mechanical equipment within a property (except burglar alarms)]. Fixed noises are addressed in the Oakland Planning Code and are enforced by the Code Enforcement Division.

## HOW IS NOISE MEASURED?

Objectively, Noise can be measured through the use of a noise meter. Sound is measured in decibels (dBA) and takes into account ambient or background noise. Fixed noise is easily measured with a meter and the recording officer can determine if the activity is in violation.

Subjectively, Transient noise is not measured scientifically. A violation is determined at the discretion of the recording officer. The noise meter is a tool available to a recording officer to assist in the determination of a violation to

# NOISE ENFORCEMENT FLOWCHART



### 附件三：交通噪音管制-

(一) Highway Traffic Noise

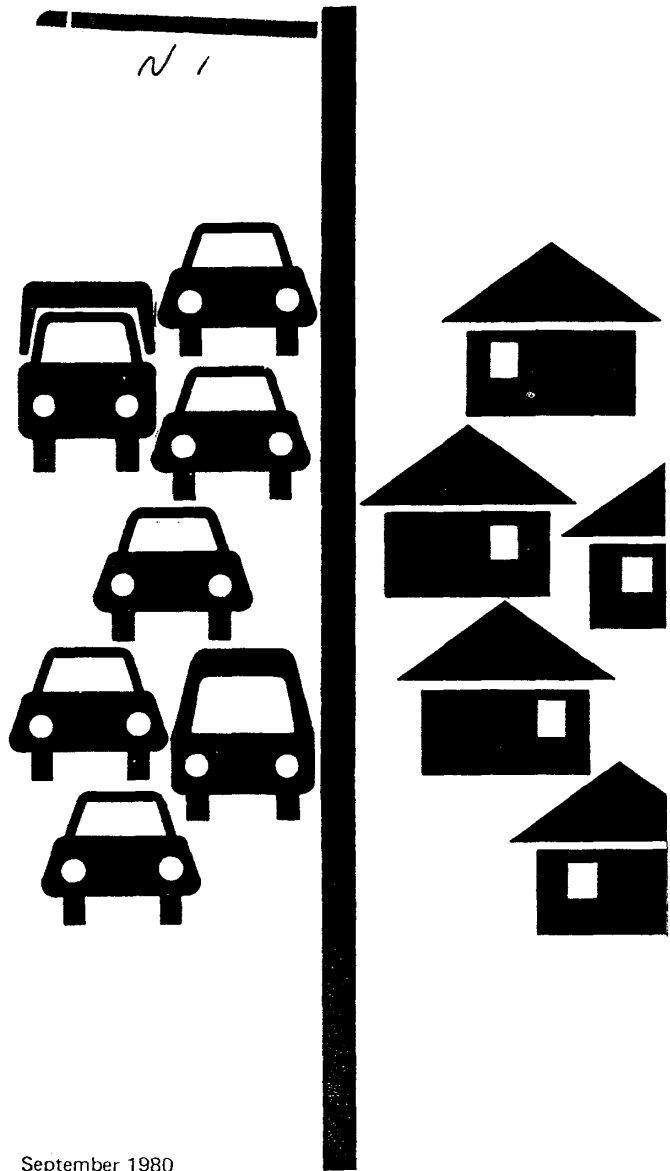
(二) Guidelines For Considering Noise in Land

Use Planning and Control



U.S. Department  
of Transportation  
Federal Highway  
Administration

# Highway Traffic Noise



For sale by the Superintendent of Documents, U.S. Government  
Printing Office, Washington, D.C. 20402

HEV-21 / 8-80 (20M)

September 1980

# The Price of Progress

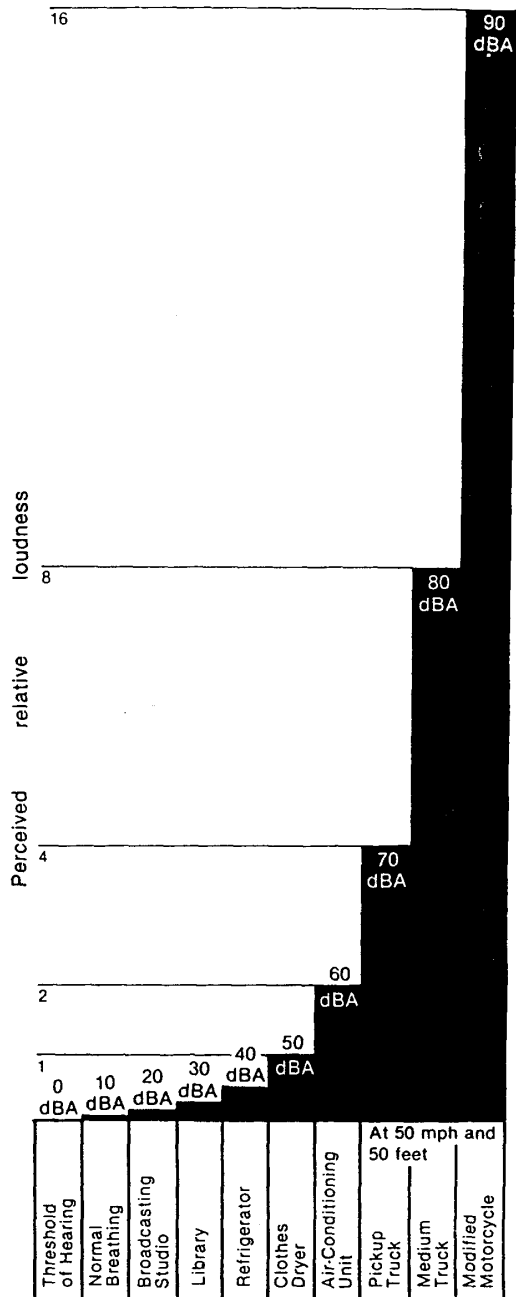
In recent years, highway traffic noise—the unpleasant, unwanted sounds generated on our Nation's streets and highways—has been of increasing concern both to the public and to local, State, and Federal officials. At the same time, modern acoustical technology has been providing better ways to lessen the adverse impacts of highway traffic noise. The purpose of this pamphlet is to explain some of these acoustical techniques which are now being employed by government agencies, highway planners and designers, construction engineers, and private developers.

## Sound and Noise

As we all know, sound is created when an object moves: the rustling of leaves as the wind blows, the air passing through our vocal chords, the almost invisible movement of the speakers on a stereo. The movements cause vibrations of the molecules in air in waves like ripples on water. When the vibrations reach our ears, we hear what we call sound.

Sound is quantified by a meter which measures units called decibels (dB). For highway traffic noise, an adjustment, or weighting, of the high- and low-pitched sounds is made to approximate the way that an average person hears sounds. The adjusted sounds are called "A-weighted levels" (dBA).

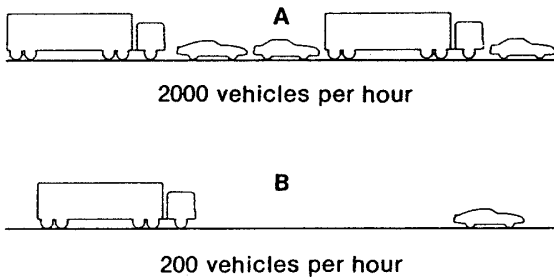
The A-weighted decibel scale begins at zero. This represents the faintest sound that can be heard by humans with very good hearing. The loudness of sounds (that is, how loud they seem to humans) varies from person to person, so there is no precise definition of loudness. However, based on many tests of large numbers of people, a sound level of 70 is twice as loud to the listener as a level of 60. This principle is illustrated on the next page.



## Causes of Traffic Noise

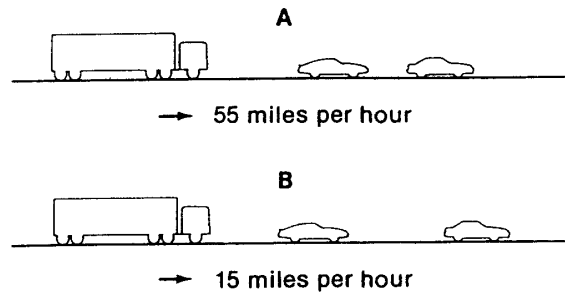
The level of highway traffic noise depends on three things: (1) the volume of the traffic, (2) the speed of the traffic, and (3) the number of trucks in the flow of the traffic. Generally, the loudness of traffic noise is increased by heavier traffic volumes, higher speeds, and greater numbers of trucks. Vehicle noise is a combination of the noises produced by the engine, exhaust, and tires. The loudness of traffic noise can also be increased by defective mufflers or other faulty equipment on vehicles. Any condition (such as a steep incline) that causes heavy laboring of motor vehicle engines will also increase traffic noise levels. In addition, there are other more complicated factors that affect the loudness of traffic noise. For example, as a person moves away from a highway, traffic noise levels are reduced by distance, terrain, vegetation, and natural and manmade obstacles. Traffic noise is not usually a serious problem for people who live more the 500 feet from heavily traveled freeways or more than 100 to 200 feet from lightly traveled roads.

### How Traffic Volume Affects Noise



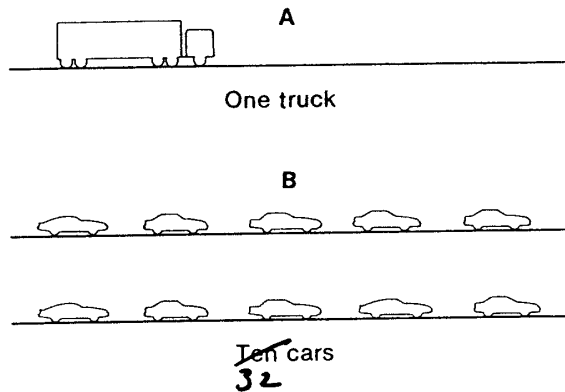
A sounds twice as loud as B

### How Speed Affects Traffic Noise



A sounds twice as loud as B

### How Trucks Affect Traffic Noise

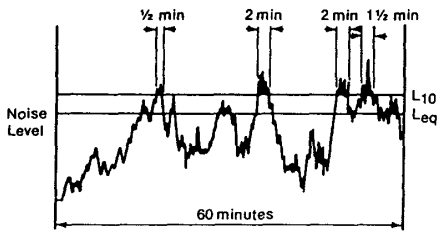


A sounds as loud as B

**Determining noise impact**

Highway traffic noise is never constant. The noise level is always changing with the number, type, and speed of the vehicles which produce the noise. Traffic noise variations can be plotted, as shown by the graph below. It is usually inconvenient and cumbersome to use such a graph to represent traffic noise in this manner. A more practical method is to convert the noise data to a single representative number.

Statistical descriptors are almost always used as a single number to describe varying traffic noise levels. The two most common statistical descriptors used for traffic noise are L10 and Leq. L10 is the sound level that is exceeded 10 percent of the time.



From the above graph, it can be seen that the shaded areas represent the amount of time that the L10 value is exceeded. Adding each interval during which this occurred shows that during the 60-minute measuring period the L10 was exceeded 6 minutes (1/2 + 2 + 2 + 1 1/2 = 6) or 10 percent of the time. The calculation of Leq is more complex. Leq is the constant, average sound level, which, over a period of time, contains the same amount of sound energy as the varying levels of the traffic noise. Leq for typical traffic conditions is usually about 3 dBA less than the L10 for the same conditions.

The Federal Highway Administration has established noise impact criteria for different land uses close to highways. Some of the exterior criteria are illustrated below.

Land Use	L10	Leq
Residential	70 dBA	67 dBA
Commercial	75 dBA	72 dBA

If a project causes a significant increase in the future noise level over the existing noise level, it is also considered to have an impact.

## What Can Be Done To Reduce Highway Noise?

Highway noise is being attacked with a three-part strategy: motor vehicle control, land use control, and highway planning and design.

The responsibilities for implementing these strategies must be shared by all levels of government: Federal, State, and local. Often local officials can most effectively solve specific noise problems in their areas, as demonstrated in the U.S. Environmental Protection Agency's (EPA) Quiet Community and Each Community Helps Others (ECHO) programs. The following two sections briefly describe how traffic noise impacts can be reduced or prevented through efforts to obtain quieter vehicles and efforts to control the future development near highways. Most of the remainder of this pamphlet focuses mainly on noise abatement in the Federal-aid highway program.

### Motor Vehicle Control

The first strategy goes right to the source of traffic noise: the vehicles. These vehicles can be designed with, for example, enclosures for the engine, fans that turn off when not needed, and better mufflers. Quieter vehicles would bring about a substantial reduction in traffic noise along those roads and streets where no other corrective measures are possible. The EPA has issued regulations which place a limit on the noise which new trucks can make. In addition, many local and State governments have passed ordinances or laws requiring existing vehicles to be properly maintained and operated.

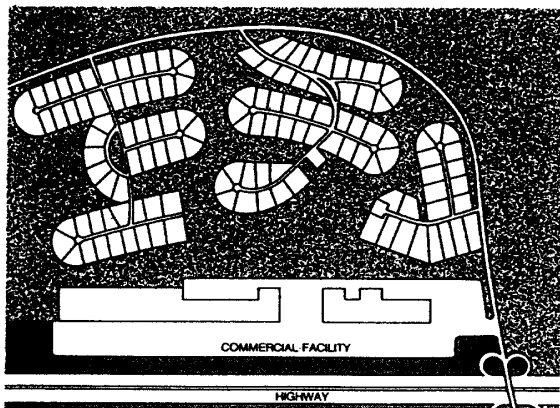
Unfortunately, due to limitations in technology, these EPA regulations for new trucks and State and local regulations for maintenance of vehicles can only partially reduce the noise created by traffic. The best that can be expected is a 5 to 10 dBA decrease in the noise level. Where larger reductions are needed, other techniques need to be employed.

### Land Use Control

A second part of this strategy calls for the control of future development. Sometimes complaints about highway traffic come from occupants of new homes built adjacent to an existing highway. Many of these highways were

Handwritten notes in the left margin of the second page, including a small diagram of a triangle, the word 'noise', and some illegible scribbles.

originally constructed through undeveloped lands. There are several hundred thousand miles of *existing* highways in this country bordered by vacant land, which may some day be developed. Prudent land use control can help to prevent many future traffic noise problems in these areas. Such controls need not prohibit development, but rather they can require reasonable distances between buildings and roads, as well as "soundproofing" or other abatement measures to lessen noise disturbances. Many local governments are working on land use control.



Less noise-sensitive commercial buildings can be placed next to a highway with residences further away.

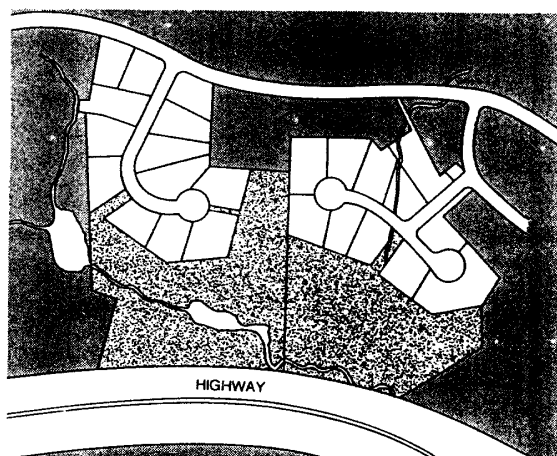
### Highway Planning and Design

Early in the planning stages of most highway improvements, highway agencies do a noise study. The purpose of this study is to determine if the project will create any noise problems. First, the existing noise levels of a highway are measured or computed by models. Then, the agency predicts what the noise levels will be if the project is constructed. If the predicted noise levels are above Federal noise criteria, the noise study must consider measures that can be taken to lessen these adverse noise impacts. (See page 6 for examples of the criteria.) This information is reported at public meetings and hearings, if they occur. There are a variety of things that a highway agency can do to lessen the impacts of highway traffic noise.

### Noise Reduction on Existing Roads

Some noise reduction measures that are possible on existing roads or on roads that are being rebuilt include creating buffer zones, planting vegetation, constructing barriers, installing noise insulation in buildings, and managing traffic.

*Buffer zones* are undeveloped, open spaces which border a highway. Buffer zones are created when a highway agency purchases land, or development rights, in addition to the normal right-of-way, so that future dwellings cannot be constructed close to the highway. This prevents the possibility of constructing dwellings that would otherwise have an excessive noise level from nearby highway traffic. An additional benefit of buffer zones is that they often improve the roadside appearance. However, because of the tremendous amount of land that must be purchased and because in many cases dwellings already border existing roads, creating buffer zones is often not possible.



Open space can be left as a buffer zone between residences and a highway



Noise barriers are solid obstructions built between the highway and the homes along the highway. Effective noise barriers can reduce noise levels by 10 to 15 decibels, cutting the loudness of traffic noise in half. Barriers can be formed from earth mounds along the road (usually called earth berms) or from high, vertical walls. Earth berms have a very natural appearance and are usually attractive. However, an earth berm can require quite a lot of land if it is very high. Walls take less space. They are usually limited to 25 feet in height because of structural and aesthetic reasons. Noise walls can be built out of wood, stucco, concrete, masonry, metal, and other materials. Many attempts are being made to construct noise barriers that are visually pleasing and that blend in with their surroundings.

However, barriers do have limitations. For a noise barrier to work, it must be high enough and long enough to block the view of a road. Noise barriers do very little good for homes on a hillside overlooking a road or for buildings which rise above the barrier. Openings in noise walls for driveway connections or intersecting streets destroy the effectiveness of barriers. In some areas, homes are scattered too far apart to permit noise barriers to be built at a reasonable cost.



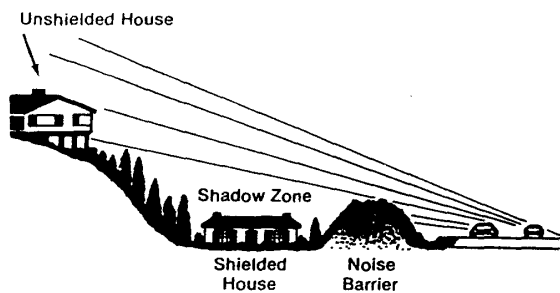
Earth Berm Noise Barrier



Wooden Noise Barrier



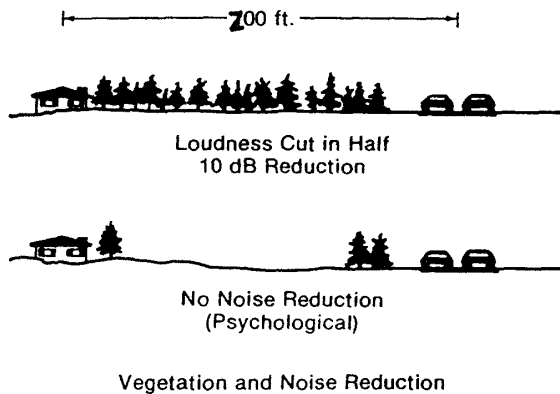
Masonry Noise Barrier



**Shadow Effect of Noise Barrier**

The lower house is protected by the barrier, but the upper one is not.

*Vegetation*, if it is high enough, wide enough, and dense enough that it cannot be seen through, can decrease highway traffic noise. A 200-foot width of dense vegetation can reduce noise by 10 decibels, which cuts in half the loudness of traffic noise. It is often impractical, however, to plant enough vegetation along a road to achieve such reductions. But, if dense vegetation already exists, it could be saved. If it does not exist, roadside vegetation can be planted to create a psychological relief, if not an actual lessening of traffic noise levels.



*Insulating buildings* can greatly reduce highway traffic noise, especially when windows are sealed and cracks and other openings are filled. Sometimes noise-absorbing material can be placed in the walls of new buildings during construction. However, insulation can be costly because air conditioning is usually necessary once the windows are sealed.

In many parts of the country, highway agencies do not have the authority to insulate buildings; thus, in those States insulation cannot be included as part of a highway project.

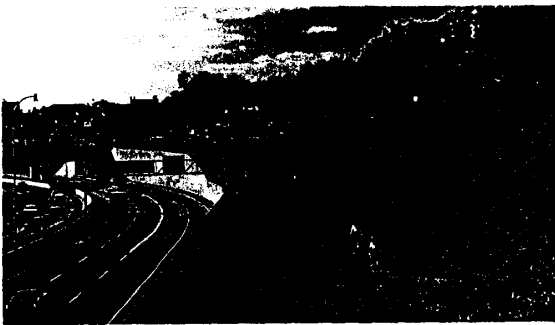
*Controlling traffic* can sometimes reduce noise problems. For example, trucks can be prohibited from certain streets and roads, or they can be permitted to use certain streets and roads only during daylight hours. Traffic lights can be changed to smooth out the flow of traffic and to eliminate the need for frequent stops and starts. Speed limits can be reduced; however, about a 20 mile-per-hour reduction in speed is necessary for a noticeable decrease in noise levels.

*Pavement* is sometimes mentioned as a factor in traffic noise. While it is true that noise levels do vary with changes in pavements and tires, it is not clear that these variations are significant when compared to the noise from exhausts and engines, especially when there are a large number of trucks on the highway. More research is needed to determine to what extent different types of pavements and tires contribute to traffic noise. Until this research is completed, the use of different types of pavement cannot be depended upon to reduce traffic noise.

### Noise Reduction on New Roads

All of the measures described above can be employed on both existing roads and on new roads. There are, however, some additional measures which can usually be used only on new roads. First, a new road can be located away from noise sensitive areas, such as schools or hospitals, and placed near nonsensitive areas, such as businesses or industrial plants. New roads can also be located in undeveloped areas.

Second, a new road can be constructed below ground level. Much of the noise from vehicles traveling on this type of road is deflected into the air by embankments on the side of the road. Thus, these embankments function in much the same way as noise barriers.



Highway Below Ground Level

Third, a new road can be designed and constructed as level as possible. The elimination of steep inclines helps to reduce traffic noise because motor vehicle engines, especially multigeared truck engines, do not have to work as hard.

Although there are a great many noise reduction measures possible, they all have limitations. Consequently, there are many situations where none of these noise reduction measures can be used. In these situations the only option left may be for local authorities to require adequate muffler devices for the louder vehicles.

### Federal Role

The Federal Highway Administration (FHWA) is the agency responsible for administering the Federal-aid highway program. Under this program, Federal funds are allotted by Congress to the individual States. However, before these monies can be used for highway projects, the projects must be approved by FHWA, which can only grant its approval for projects that are developed in accordance with Federal statutes and regulations. One of these regulations requires that a noise study be accomplished to determine what noise impacts, if any, will result from the proposed highway improvement and what measures will be taken to lessen these noise impacts. If noise impacts are expected, then noise reduction measures that are determined by the State highway agency and the FHWA to be practicable, reasonable, and acceptable to the public must be incorporated into the highway improvement. The costs of the noise reduction measures are included with the other costs of the highway improvement and are eligible for Federal funding in the same proportion as other aspects of the project.

State highway agencies may also use Federal highway grants for noise reduction projects on existing roads on the Federal-aid system. The monies spent on noise reduction measures are deducted from funds which would otherwise be available for highway construction.

Federal funds may be used for the construction of noise barriers, for acquisition of land on which to build such barriers, and for the purchase of undeveloped lands as a preemptive buffer zone. Traffic operational measures such as truck routes and restriction of hours of operation are often feasible noise abatement measures, and the costs of such measures are eligible for Federal fundings. The "soundproofing" of public-use institutional buildings may be incorporated in Federal-aid highway projects to abate traffic noise, but the use of Federal funds for soundproofing commercial buildings or private dwellings is not normally permitted.

## Highway Noise Related Web Sites

### **Caltrans (California Department of Transportation) Environmental Analysis**

<http://env.dot.ca.gov/env/noise/index.htm>

### **Highway Traffic Noise (FHWA)**

<http://www.fhwa.dot.gov/environment/noise/index.htm>

### **Highway Traffic Noise in the United States Problem and Response (FHWA)**

<http://www.fhwa.dot.gov/environment/probresp.htm>

### **Highway Noise Barrier Design Handbook (FHWA)**

<http://www.fhwa.dot.gov/////environment//noise/Manual.htm>

### **FHWA Highway Noise Model**

<http://www.thewalljournal.com/a1f04/tnm/>

### **Transportation Research Board**

<http://www.trb.org/>



June 1980

# GUIDELINES FOR CONSIDERING NOISE IN LAND USE PLANNING AND CONTROL



U.S. Department of  
Transportation





**GUIDELINES FOR CONSIDERING  
NOISE  
IN  
LAND USE PLANNING AND CONTROL**

**June 1980**

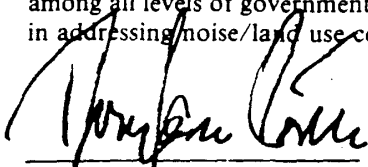
**Federal Interagency Committee on Urban Noise**



FEDERAL  
INTERAGENCY COMMITTEE  
ON URBAN NOISE

*To all local government officials and others interested in  
noise/land use concerns:*

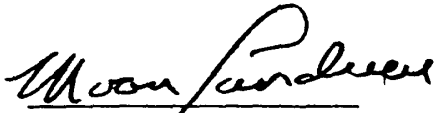
In his Environmental Message to Congress in August, 1979, President Carter announced a new Urban Noise Initiative to reduce urban noise. The Federal Interagency Committee on Urban Noise was thereby established to coordinate various programs, including an interagency program designed "to encourage noise sensitive development, such as housing, to be located away from major noise sources." As a first step in that program, the Committee is pleased to make available this document which presents a broad consolidation of Federal guidance on the incorporation of noise considerations in local development planning and site review operations. We hope that it will facilitate improved communication among all levels of government on noise compatible land use and that you will find it useful in addressing noise/land use concerns in your community.



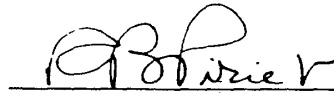
Douglas Costle  
Administrator  
U.S. Environmental Protection Agency



Neil Goldschmidt  
Secretary  
U.S. Department of Transportation



Moon Landrieu  
Secretary  
U.S. Department of Housing  
and Urban Development



Robert B. Pirie, Jr.  
Assistant Secretary of Defense  
(Manpower, Reserve Affairs & Logistics)  
U.S. Department of Defense



Max Cleland  
Administrator  
Veterans Administration

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## INTRODUCTION

In recent years noise has become a recognized factor in the community planning process. Some significant advancements are being made in the reduction of noise at its source; however, noise cannot be eliminated completely. Local, state, and Federal agencies, in recognition of this fact, have developed guidelines and procedures to deal with noise in the community land use planning process.

A number of Federal agencies have published policies and/or guidance on noise and land use. These agencies have done this for several different reasons: to carry out public law mandates to protect the public health and welfare and provide for environmental enhancement; to serve as the basis for grant approvals; and to integrate the consideration of noise into the overall comprehensive planning and interagency/intergovernmental coordination process.

Because the purposes and uses of these policy and guidance packages are often different, they can appear to be inconsistent and incomparable. This situation may have inhibited state and local planning and decision making with respect to noise and land use and, thus, inhibited consideration of noise in various Federal-grant-in-aid programs.

The purpose of this document is to put the various Federal agency policy and guidance packages into perspective. Although this document does not replace the individual Federal agency material, it can serve as the departure point for dealing with each agency's programs and facilitate the consideration of noise in all land use planning and interagency/intergovernmental coordination processes.

Although several of these Federal programs include noise standards or guidelines as part of their eligibility and performance criteria, the primary responsibility for integrating noise considerations into the planning process rests with local government which generally has exclusive control over actual land development. Noise, like soil conditions, physiographic features, seismic stability, floodplains and other considerations, is a valid land use determinant. Scientific evidence clearly points to noise as not simply a nuisance but an important health and welfare concern.

The purpose of considering noise in the land use planning process is not to prevent development but rather to encourage development that is compatible with various noise levels. The objective is to guide noise sensitive land uses away from the noise and encourage non-sensitive land uses where there is noise. Where this is not possible, measures should be included in development projects to reduce the effects of the noise.

Section 1 presents consolidated Federal agency land use compatibility guidelines. Section 2 overviews techniques by which the guidelines can be implemented. Section 3 briefly overviews the major Federal agency noise control policies and programs. The Appendices contain brief descriptions of environmental noise descriptors and annotated bibliographies of selected Federal documents.

## Section 1. LAND USE COMPATIBILITY GUIDELINES

This section contains two tables. Table 1 classifies noise levels into a set of noise zones according to the most commonly used environmental noise descriptors. Noise zones are identified in order of increasing noise level by the letters "A" through "D". The descriptors are discussed in Appendix A. The Day-Night Average Sound Level (DNL)<sup>1</sup> descriptor can be used for all noise sources. The Equivalent Sound Level ( $L_{eq}$ ) is included because some highway noise data can be expected to be in terms of an equivalent sound level for the highway "design hour" — see Table 1 for description of when  $L_{eq}$  (design hour) is equivalent to DNL for planning purposes. The  $L_{eq}$  descriptor itself is not unique to highways and can be applied to any noise source. The Noise Exposure Forecast (NEF) descriptor is used for aircraft noise only and is being superceded by DNL. The Community Noise Equivalent Level (CNEL) descriptor (for the state of California) uses values similar to DNL. Older descriptors unique to airport noise environments, such as the Composite Noise Rating (CNR), may be encountered. For general comparison purposes  $L_{dn} 65 = NEF 30 = CNR 100$ ,  $L_{dn} 75 = NEF 40 = CNR 115$ .

Table 2 contains suggested land use compatibility guidelines. The table arrays land uses<sup>2</sup> on the left with the noise zones of Table 1 across the top. Land use compatibility is expressed as being "compatible", "incompatible" and "compatible with restrictions." The system as presented in the table is comprised of two digit categories identifying land use activity in the most generalized way (e.g. "10 Residential"). Within some of the two-digit categories here are sub-categories identifying activity in greater detail. Compatibility as expressed in this table represents a consolidation of existing Federal agency guidelines. This table serves as a point of departure in making several kinds of determinations, including whether various land uses should be allowed at particular sites based upon the noise levels at those sites. Detailed planning should be based on the procedures and specific general planning guidance found in appropriate Federal agency documents (Appendix B) as well as the needs, desires and site characteristics of the particular community. Another input to the

<sup>1</sup>Day-Night Average Sound Level is abbreviated as DNL and symbolized mathematically as  $L_{dn}$  (e.g.,  $L_{dn} 65$ ,  $L_{dn} 75$ , etc.).

<sup>2</sup>Land uses are here categorized according to the standard land use activity categories found in the *Standard Land Use Coding Manual*, Housing and Home Finance Agency (now Department of Housing and Urban Development) and Bureau of Public Roads (now Department of Transportation/Federal Highway Administration), 1965.

planning process is the statement of public health and welfare goals in EPA's "Levels" Document. The levels can be used by individual communities to incorporate public health and welfare goals into the planning process. These levels do not *in themselves*, however, form the sole basis for appropriate land use actions because they do not consider cost, feasibility, the noise levels from any particular source, or the development needs of the community and do include an adequate margin of safety. They should be considered by all communities in their planning, including those who now enjoy quiet and wish to preserve it, as well as those which are relatively noisy and wish to mitigate the problem.

**TABLE 1. NOISE ZONE CLASSIFICATION**

Noise Zone	Noise Exposure Class	Noise Descriptor			HUD Noise Standards
		DNL <sup>1</sup> Day-Night Average Sound Level	L <sub>eq</sub> (hour) <sup>3</sup> Equivalent Sound Level	NEF <sup>4</sup> Noise Exposure Forecast	
A	Minimal Exposure	Not Exceeding 55	Not Exceeding 55	Not Exceeding 20	"Acceptable"
B	Moderate Exposure	Above 55 <sup>2</sup> But Not Exceeding 65	Above 55 But Not Exceeding 65	Above 25 But Not Exceeding 30	
C-1	Significant Exposure	Above 65 Not Exceeding 70	Above 65 Not Exceeding 70	Above 30 But Not Exceeding 35	"Normally Unacceptable" <sup>5</sup>
C-2		Above 70 But Not Exceeding 75	Above 70 But Not Exceeding 75	Above 35 But Not Exceeding 40	
D-1	Severe Exposure	Above 75 But Not Exceeding 80	Above 40 But Not Exceeding 80	Not Exceeding 45	"Unacceptable"
D-2		Above 80 But Not Exceeding 85	Above 80 But Not Exceeding 85	Above 45 But Not Exceeding 50	
D-3		Above 85	Above 85	Above 50	

<sup>1</sup>CNEL — Community Noise Equivalent Level (California only) uses the same values.

<sup>2</sup>HUD, DOT and EPA recognize L<sub>dn</sub> = 55 dB as a goal for outdoors in residential areas in protecting the public health and welfare with an adequate margin of safety (Reference: EPA "Levels" Document.) However, it is not a *regulatory* goal. It is a level defined by a negotiated scientific consensus without concern for economic and technological feasibility or the needs and desires of any particular community.

<sup>3</sup>The Federal Highway Administration (FHWA) noise policy uses this descriptor as an alternative to L<sub>10</sub> (noise level exceeded ten percent of the time) in connection with its policy for highway noise mitigation. The L<sub>eq</sub> (design hour) is equivalent to DNL for planning purposes under the following conditions: 1) heavy trucks equal ten percent of total traffic flow in vehicles per 24 hours; 2) traffic between 10 p.m. and 7 a.m. does not exceed fifteen percent of the average daily traffic flow in vehicles per 24 hours. Under these conditions DNL equals L<sub>10</sub> - 3 decibels.

<sup>4</sup>For use in airport environs only; is now being superseded by DNL.

<sup>5</sup>The HUD Noise Regulation allows a certain amount of flexibility for non-acoustic benefits in zone C-1. Attenuation requirements can be waived for projects meeting special requirements.



TABLE 2. SUGGESTED LAND USE COMPATIBILITY GUIDELINES

Land Use		Noise Zones/DNL Levels in L <sub>dn</sub>						
SLUCM No.	Name	A 0-55	B 55-65	C-1 65-70	C-2 70-75	D-1 75-80	D-2 80-85	D-3 85 +
<b>10</b>	<b>Residential</b>							
11	Household units.							
11.11	Single units — detached	Y	Y*	25 <sup>1</sup>	30 <sup>1</sup>	N	N	N
11.12	Single units — semidetached	Y	Y*	25 <sup>1</sup>	30 <sup>1</sup>	N	N	N
11.13	Single units — attached row	Y	Y*	25 <sup>1</sup>	30 <sup>1</sup>	N	N	N
11.21	Two units — side-by-side	Y	Y*	25 <sup>1</sup>	30 <sup>1</sup>	N	N	N
11.22	Two Units — one above the other	Y	Y*	25 <sup>1</sup>	30 <sup>1</sup>	N	N	N
11.31	Apartments — walk up	Y	Y*	25 <sup>1</sup>	30 <sup>1</sup>	N	N	N
11.32	Apartments — elevator	Y	Y*	25 <sup>1</sup>	30 <sup>1</sup>	N	N	N
12	Group quarters	Y	Y*	25 <sup>1</sup>	30 <sup>1</sup>	N	N	N
13	Residential hotels	Y	Y*	25 <sup>1</sup>	30 <sup>1</sup>	N	N	N
14	Mobile home parks or courts	Y	Y*	N	N	N	N	N
15	Transient lodgings	Y	Y*	25 <sup>1</sup>	30 <sup>1</sup>	35 <sup>1</sup>	N	N
16	Other residential	Y	Y*	25 <sup>1</sup>	30 <sup>1</sup>	N	N	N
<b>20</b>	<b>Manufacturing</b>							
21	Food and kindred products — manufacturing	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
22	Textile mill products — manufacturing	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
23	Apparel and other finished products made from fabrics, leather, and similar materials — manufacturing	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
24	Lumber and wood products (except furniture) — manufacturing	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
25	Furniture and fixtures.— manufacturing	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
26	Paper and allied products — manufacturing	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
27	Printing, publishing, and allied industries	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
28	Chemicals and allied products — manufacturing	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
29	Petroleum refining and related industries	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N

\*The designation of these uses as “compatible” in this zone reflects individual Federal agencies’ consideration of general cost and feasibility factors as well as past community experiences and program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider. For an indication of possible community reaction in residential environments at various levels of cumulative noise, Table D-1 in Appendix D should be consulted.

**NOTES FOR TABLE 2**

1. a) Although local conditions may require residential use, it is discouraged in C-1 and strongly discouraged in C-2. The absence of viable alternative development options should be determined and an evaluation indicating that a demonstrated community need for residential use would not be met if development were prohibited in these zones should be conducted prior to approvals.
- b) Where the community determines that residential uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB (Zone C-1) and 30 dB (Zone C-2) should be incorporated into building codes and be considered in individual approvals. Normal construction can be expected to provide a NLR of 20 dB, thus the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. Additional consideration should be given to modifying NLR levels based on peak noise levels.
- c) NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, design and use of berms and barriers can help mitigate outdoor noise exposure particularly from ground level sources. *Measures that reduce noise at a site should be used wherever practical in preference to measures which only protect interior spaces.*
2. Measures to achieve NLR of 25 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
3. Measures to achieve NLR of 30 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
4. Measures to achieve NLR of 35 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

**KEY TO TABLE 2**

SLUCM	Standard Land Use Coding Manual
Y (Yes)	Land Use and related structures compatible without restrictions.
N (No)	Land Use and related structures are not compatible and should be prohibited.
NLR (Noise Level Reduction)	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
Y <sup>x</sup> (Yes with restrictions)	Land Use and related structures generally compatible; see notes 2 through 4.
25, 30, or 35	Land Use and related structures generally compatible; measures to achieve NLR of 25, 30 or 35 must be incorporated into design and construction of structure.
25*, 30* or 35*	Land Use generally compatible with NLR; however, measures to achieve an overall do not necessarily solve noise difficulties and additional evaluation is warranted.

**TABLE 2. SUGGESTED LAND USE COMPATIBILITY GUIDELINES (continued)**

Land Use		Noise Zones/DNL Levels in L <sub>dn</sub>						
SLUCM No.	Name	A 0-55	B 55-65	C-1 65-70	C-2 70-75	D-1 75-80	D-2 80-85	D-3 85 +
30	<b>Manufacturing (cont'd)</b>							
31	Rubber and misc. plastic products — manufacturing	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
32	Stone, clay and glass products — manufacturing	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
33	Primary metal industries	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
34	Fabricated metal products — manufacturing.	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks — manufacturing	Y	Y	Y	25	30	N	N
39	Miscellaneous manufacturing	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	
40	<b>Transportation, communication and utilities</b>							
41	Railroad, rapid rail transit and street railway transportation	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	Y
42	Motor vehicle transportation	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	Y
43	Aircraft transportation	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	Y
44	Marine craft transportation	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	Y
45	Highway and street right-of-way	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	Y
46	Automobile parking	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
47	Communication	Y	Y	Y	25 <sup>5</sup>	30 <sup>5</sup>	N	N
48	Utilities	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	Y
49	Other transportation, communication and utilities	Y	Y	Y	25 <sup>5</sup>	30 <sup>5</sup>	N	N
50	<b>Trade</b>							
51	Wholesale trade	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
52	Retail trade — building materials, hardware and farm equipment	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
53	Retail trade — general merchandise	Y	Y	Y	25	30	N	N
54	Retail trade — food	Y	Y	Y	25	30	N	N
55	Retail trade — automotive, marine craft, aircraft and accessories	Y	Y	Y	25	30	N	N
56	Retail trade — apparel and accessories	Y	Y	Y	25	30	N	N
57	Retail trade — furniture, home furnishings and equipment	Y	Y	Y	25	30	N	N
58	Retail trade — eating and drinking establishments	Y	Y	Y	25	30	N	N
59	Other retail trade	Y	Y	Y	25	30	N	N

## NOTES FOR TABLE 2

2. Measures to achieve NLR of 25 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
3. Measures to achieve NLR of 30 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
4. Measures to achieve NLR of 35 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
5. If noise sensitive use indicated NLR; if not use is compatible.

## KEY TO TABLE 2

SLUCM	Standard Land Use Coding Manual
Y (Yes)	Land Use and related structures compatible without restrictions.
N (No)	Land Use and related structures are not compatible and should be prohibited.
NLR (Noise Level Reduction)	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
Y <sup>x</sup> (Yes with restrictions)	Land Use and related structures generally compatible; see notes 2 through 4.
25, 30, or 35	Land Use and related structures generally compatible; measures to achieve NLR of 25, 30 or 35 must be incorporated into design and construction of structure.
25*, 30* or 35*	Land Use generally compatible with NLR; however, measures to achieve an overall noise reduction do not necessarily solve noise difficulties and additional evaluation is warranted.

TABLE 2. SUGGESTED LAND USE COMPATIBILITY GUIDELINES (continued)

Land Use		Noise Zones/DNL Levels in L <sub>dn</sub>						
SLUCM No.	Name	A 0-55	B 55-65	C-1 65-70	C-2 70-75	D-1 75-80	D-2 80-85	D-3 85+
<b>60</b>	<b>Services</b>							
61	Finance, insurance and real estate services	Y	Y	Y	25	30	N	N
62	Personal services	Y	Y	Y	25	30	N	N
62.4	Cemeteries	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4,11</sup>	Y <sup>6,11</sup>
63	Business services	Y	Y	Y	25	30	N	N
64	Repair services	Y	Y	Y	Y <sup>2</sup>	Y <sup>3</sup>	Y <sup>4</sup>	N
65	Professional services	Y	Y	Y	25	30	N	N
65.1	Hospitals, nursing homes	Y	Y*	25*	30*	N	N	N
65.1	Other medical facilities	Y	Y	Y	25	30	N	N
66	Contract construction services	Y	Y	Y	25	30	N	N
67	Governmental services	Y	Y*	Y*	25*	30*	N	N
68	Educational services	Y	Y*	25*	30*	N	N	N
69	Miscellaneous services	Y	Y	Y	25	30	N	N
<b>70</b>	<b>Cultural, entertainment and recreational</b>							
71	Cultural activities (including churches)	Y	Y*	25*	30*	N	N	N
71.2	Nature exhibits	Y	Y*	Y*	N	N	N	N
72	Public assembly	Y	Y	Y	N	N	N	N
72.1	Auditoriums, concert halls	Y	Y	25	30	N	N	N
72.11	Outdoor music shells, amphitheaters	Y	Y*	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	Y	Y	Y <sup>7</sup>	Y <sup>7</sup>	N	N	N
73	Amusements	Y	Y	Y	Y	N	N	N
74	Recreational activities (incl. golf courses, riding stables, water recreation)	Y	Y*	Y*	25*	30*	N	N
75	Resorts and group camps	Y	Y*	Y*	Y*	N	N	N
76	Parks	Y	Y*	Y*	Y*	N	N	N
79	Other cultural, entertainment and recreation	Y	Y*	Y*	Y*	N	N	N
<b>80</b>	<b>Resource production and extraction</b>							
81	Agriculture (except livestock)	Y	Y	Y <sup>8</sup>	Y <sup>9</sup>	Y <sup>10</sup>	Y <sup>10,11</sup>	Y <sup>10,11</sup>
81.5 to 81.7	Livestock farming and animal breeding	Y	Y	Y <sup>8</sup>	Y <sup>9</sup>	N	N	N
82	Agricultural related activities	Y	Y	Y <sup>8</sup>	Y <sup>9</sup>	Y <sup>10</sup>	Y <sup>10,11</sup>	Y <sup>10,11</sup>
83	Forestry activities and related services	Y	Y	Y <sup>8</sup>	Y <sup>9</sup>	Y <sup>10</sup>	Y <sup>10,11</sup>	Y <sup>10,11</sup>
84	Fishing activities and related services	Y	Y	Y	Y	Y	Y	Y
85	Mining activities and related services	Y	Y	Y	Y	Y	Y	Y
89	Other resource production and extraction	Y	Y	Y	Y	Y	Y	Y

\*The designation of these uses as "compatible" in this zone reflects individual Federal agencies' consideration of cost and feasibility factors as well as program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider. For an indication of possible community reaction in residential environments at various levels of cumulative noise, Table D-1 in Appendix D should be consulted.

**NOTES FOR TABLE 2**

2. Measures to achieve NLR of 25 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
3. Measures to achieve NLR of 30 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
4. Measures to achieve NLR of 35 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
6. No buildings.
7. Land use compatible provided special sound reinforcement systems are installed.
8. Residential buildings require a NLR of 25.
9. Residential buildings require a NLR of 30.
10. Residential buildings not permitted.
11. Land use not recommended, but if community decides use is necessary, hearing protection devices should be worn by personnel.

**KEY TO TABLE 2**

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25*, 30* or 35*	Land Use generally compatible with NLR; however, measures to achieve an overall noise reduction do not necessarily solve noise difficulties and additional evaluation is warranted.

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## Section 2. TECHNIQUES FOR DEALING WITH NOISE IN LAND USE PLANNING

There are many techniques that local governments can use to reduce the effect of noise on surrounding land uses. These techniques range from simply increasing public awareness of existing noise levels to the very drastic, but admittedly very effective step of public purchase of severely exposed land uses. The following table outlines some of these techniques. The table is not intended to be exhaustive. Rather it is presented simply to illustrate the range of techniques available to reduce the effect of noise on land uses.

The techniques are arrayed in order of increasing stringency and general effectiveness. The effectiveness of any given technique is, however, very much a function of the specific noise situation and the way in which the technique is applied. It should also be understood that often the most effective approach will be a *combination* of techniques such as enacting both zoning and building code requirements.

The table includes, for each technique, a brief general summary of current experience with the techniques. The column entitled "situation where most applicable" includes indications of inherent limitations to given techniques. The "comments" column is intended to provide general insights on how the techniques work.



**TABLE 3. TECHNIQUES FOR DEALING WITH NOISE IN LAND USE PLANNING**

TECHNIQUE	SITUATION WHERE MOST APPLICABLE	COMMENTS
I. Increasing Public Awareness a. Citizen Education	Anywhere	Can be an important factor in determining the marketability of homes and other land uses. Can have a direct effect on developers and builders. Use in combination with other actions.
b. Prior Notice of Noise Levels to Renters and Purchasers	Anywhere	Can be required by local ordinance. Enables renters and purchasers to choose environment with full information. May reduce or eliminate subsequent complaints or damage claims.
II. Coordination a. OMB Circular A-95 Process	Anywhere Federal and Federally assisted projects are proposed	Allows identification of noise problems in the review and comment of Federal and Federally assisted plans, programs and projects. Indirect control.
b. Environmental Assessment Process	Anywhere Environmental Impact Analyses are required.	Indirect Control. Increase awareness of noise. May discourage inappropriate projects. Mechanism to propose mitigation measures.
III. Providing Advisory Services a. Architectural or Planning Review	Where there is appropriate staff or funding.	Site-specific analysis for each case.
b. Design Assistance	Where there is appropriate staff or funding.	Allows inclusion of noise mitigation measures such as building attenuation, siting modification, berms, and barriers, etc.
c. Information Libraries	Anywhere	Passive advisory service.

*Continued on following page*

TABLE 3. TECHNIQUES FOR DEALING WITH NOISE IN LAND USE PLANNING (continued)

TECHNIQUE	SITUATION WHERE MOST APPLICABLE	COMMENTS
IV. Incorporating Noise Issues Into Comprehensive Planning Process	Where comprehensive planning process is established particularly where controls (zoning) must implement plan.	Works best when noise is considered a basic suitability factor along with others such as slope, soils conditions, etc. Should be addressed in all types of plans. May require enabling legislation.
V. Incorporating Noise Issues Into Environmental Management Programs	Where programs such as Area-wide Waste Management, Air Quality, Coastal Zone Management, Prime and Unique Agricultural Lands and Floodplains and Wetlands are established.	These programs influence land use policy.
VI. Development Codes and Policies	Where portions of development projects fall within noise exposure areas.	May not be applicable for airborne aircraft. May require enabling legislation.
a. Subdivision Regulations and/or site plan approvals. Require Noise Reduction Considerations in site design (site orientation, buffers, barriers, etc.)	Where interior noise exposure can be reduced to acceptable levels and buildings should otherwise be prohibited.	Noise Level Reduction (NLR) up to 35 dB (15 dB above normal construction). Outdoor environment not protected. May require enabling legislation to use noise zones for building code restrictions. Difficult to apply retroactively. Local opposition to increased building costs possible. Related to energy conservation. Requirements might also be incorporated into health and/or occupancy codes.
b. Building codes. Require sound insulation, isolation, absorption in building construction		

Continued on following page

**TABLE 3. TECHNIQUES FOR DEALING WITH NOISE IN LAND USE PLANNING (continued)**

TECHNIQUE	SITUATION WHERE MOST APPLICABLE	COMMENTS
VI. Development Codes and Policies — <i>continued</i>		
c. Special Permits and/or Special Planning Districts	Anywhere a permit granting system exists or can be started.	Site-specific analysis would be required for each case. May require enabling legislation.
d. Special Use Designations	Anywhere unique or special land characteristics exist (cultural or historic, scenic, wetlands, floodplains, prime agricultural lands, water supply sources).	Such areas may be noise exposed and those designations will normally assure noise compatibility. May require legislation.
e. Official Map	Anywhere streets exist or are planned.	Planned major streets should avoid noise sensitive areas and should encourage development in areas not exposed to noise.
f. Capital Improvements	Anywhere	Governmental constructed utilities, streets, and facilities should be sited to encourage compatible use and be in themselves compatible.
VII. Land Use Controls		
a. Zoning	Anywhere	
1. For compatible land uses		Should be based on a comprehensive plan. May require enabling legislation to use noise as a criterion. Not retroactive and can be removed upon short notice. Most effective for undeveloped areas.
2. To require buffer areas	Where noise source is at ground level.	Easy to implement in low density areas. Not effective for airborne aircraft. May require enabling legislation.
3. To require berms or barriers	Where noise source is at ground level.	Effective but care is needed to insure that it is aesthetically desirable. May require enabling legislation.

*Continued on following page*

TABLE 3. TECHNIQUES FOR DEALING WITH NOISE IN LAND USE PLANNING (continued)

TECHNIQUE	SITUATION WHERE MOST APPLICABLE	COMMENTS
VII. Land Use Controls — <i>continued</i> 4. To allow cluster or planned unit develop- ment	For medium and large developments	Significant potential benefits. Build- ers can incorporate buffer areas without reducing number of units. May require enabling legislation.
VIII. Purchase Real Property Interests a. Fee Purchase 1. For compatibility	Where noise levels are extreme	Attempts to contain worst noise ef- fects within the right-of-way or site. May require enabling legislation.
2. For public use	Where public use is compatible and needed in that location.	Limited by need for compatible public uses.
b. Fee purchase and resale with development restric- tions	Where other measures are impracti- cal	Public authority may be reluctant. Local government may object to controls. Business may object to government becoming developer. De- pendent on demand feasibility for compatible use. May require en- abling legislation.
c. Easement (development rights) purchase	Where other measures are impracti- cal	May be more practical than Fee Sim- ple purchase. May require enabling legislation.
d. Agricultural Land Preser- vation District	Where land is suitable.	Requires appropriate legislation. Minimum site size of 50 acres is typical and usually allows a single farm residence. Presents possible bird strike hazards.
IX. Property Tax Incentives (open space, agricultural, etc.)	Where tax pressures exist on owners of undeveloped land.	Requires enabling legislation. Easy in many cases to implement. Cannot prevent incompatible development but can allow economically produc- tive compatible land use.



### Section 3. FEDERAL AGENCY PROGRAMS AND POLICIES

The purpose of this section is to briefly overview the noise policies and programs relating to land use of the following agencies:

- Department of Defense (DOD)
- Department of Housing and Urban Development (HUD)
- Environmental Protection Agency (EPA)
- Department of Transportation/Federal Aviation Administration (DOT/FAA)
- Department of Transportation/Federal Highway Administration (DOT/FHWA)
- Veterans Administration (VA)

The Federal noise policies and programs discussed in this section all share the common goal of protecting the public health and welfare with regard to noise. Most policies also state additional goals in recognition that noise is a specific constraint on particular agency missions. DOD, for example, states as a primary goal of its noise policy, the continuance of operational integrity at its airfields.

All of the policies address in varying degrees (and some not exclusively), transportation noise problems, particularly those of highways and airport systems. The policies concentrate on these noise sources not only because their noise problems are among the most pervasive, but because Federal agencies have assisted by providing billions of dollars for their construction and maintenance. Most, however, are actually owned and operated by local and State governments.

The major differences among the policies center upon the noise levels specified and the types of noise measures used or required. There are *four different types of noise levels* used in these policies:

- mitigation levels (e.g., FHWA design levels);
- levels required to protect the public health and welfare (e.g., EPA "levels" document);
- general planning (land use) levels (e.g., DOD);
- levels required for Federal assistance (e.g., HUD, VA) (these are similar to the general planning levels).

As Table 4 shows, a specific purpose is associated with each type of level. *Misuse of a particular type in any situation can produce erroneous results.*

Primarily because of differences in statutory authority, the noise policies differ in the kinds of noise actions and techniques emphasized. The FAA and EPA regulations, for example, stress source and operational controls for aircraft and highway vehicles while the FHWA policy, in the main, stresses noise mitigation (e.g., placement of noise barriers) at noise sensitive locations along highways. HUD and VA, on the other hand, require, in certain cases, that the receiver (e.g., residential development) be provided noise attenuation as a condition for mortgage insurance or assistance.

A brief overview of individual agency noise policies follows.

TABLE 4. FEDERAL AGENCY POLICY AND PROGRAM SUMMARY

AGENCY	1. DEPARTMENT OF DEFENSE (DOD)	2. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)	3. ENVIRONMENTAL PROTECTION AGENCY (EPA)	4. DOT/FEDERAL AVIATION ADMINISTRATION (FAA)	5. DOT/FEDERAL HIGHWAY ADMINISTRATION (FHWA)	6. VETERAN'S ADMINISTRATION (VA)
Type of Program or Policy	Air Installations Compatible Use Zones (AICUZ) Program	HUD Noise Regulations	Health & Welfare Guidance	Aviation Noise Abatement Policy	Highway Noise Policy	VA Noise Policy
Key Documents	DOD Instruction 4165.57 (1977) Installation AICUZ Studies	24 CFR Part 51 Subpart B; Noise Assessment Guidelines (1980)	EPA "Levels" Document (1974)	DOT/FAA Aviation Noise Abatement Policy (1976) Advisory Circular: 150/5050-6 (1977)	FHPM 7-7.3 (1976)	Section VIII Appraisal of residential properties near Airports (1969)
Noise Levels	Title of Levels	Levels which determine whether proposed sites are eligible for HUD insurance or assistance	Levels which are required to protect the public health and welfare with an adequate margin of safety	Levels used as "starting points" in determining noise/land use relationships	Design Noise Levels	Levels determining whether proposed sites are eligible for VA assistance
	Purpose of Levels	Guidance to communities for planning. Reflects cost, feasibility, past community experience, general program objectives and consideration of health and welfare goals.	These levels identify in scientific terms the threshold of effect. While the levels have relevance for planning, they do not in themselves form the basis for appropriate land use actions because they do not consider cost, feasibility or the development needs of the community. The user should make such tradeoffs.	Guidance to communities for planning. Reflects safety, cost, feasibility, general program objectives and consideration of health and welfare goals.	These levels are used in determining where noise mitigation on a particular highway project is warranted. They do reflect cost and feasibility considerations. They are not appropriate land use criteria. Location Specific.	See above. Reflects cost, feasibility, general program objectives and consideration of health and welfare goals.
Source to which applied	Military Airfields	All sources	All sources	Civil Airports	Highways only	Airports only
	Noise Descriptors Used	DNL	DNL	DNL, (CNEL, California only)	Leq or L10 for design hour	Various (including DNL)



### **Department of Defense (DOD)**

Department of Defense policy for noise compatible land use guidance is called the Air Installation Compatible Use Zone (AICUZ). Each military service has an AICUZ program to investigate, describe, and study noise exposure and land use at all DOD air installations. AICUZ studies for each installation are prepared and given to the public and local, regional, state, and other federal agencies for use in their land use planning/control and intergovernmental programs and processes. Each study contains noise contours, accident potential zones, existing and future land use compatibilities and incompatibilities, land use planning/control recommendations.

#### **Department of Defense Policy:**

- Requires that all reasonable, economical, and practical measures will be taken to reduce and/or control the generation of noise from flying.
- Is to work toward achieving compatibility between air installations and neighboring civilian communities by means of a compatible land use planning and control process conducted by the local community.
- Requires working with local governments, local planning commissions, special purpose districts, regional planning agencies, state agencies, and state legislatures as well as other federal agencies.
- Includes technical assistance to local, regional, and state agencies to assist them in developing their land use planning and regulatory processes, to explain an AICUZ study and its implications, and generally to work toward compatible planning and development in the vicinity of military airfields.

### **Department of Housing and Urban Development (HUD)**

The major purpose of the Department of Housing and Urban Development's (HUD) noise regulations (24 CFR Part 51 Subpart B) is to insure that activities assisted or insured by the Department achieve the goal of a suitable living environment. HUD also supports other agencies efforts in noise control.

The regulations generally apply to all HUD actions and provide minimum national standards to protect citizens against excessive noise in their communities and places of residence. The basic policy is that HUD assistance for construction of new noise sensitive uses is prohibited generally for projects with Unacceptable noise exposures and is discouraged for projects with Normally Unacceptable noise exposure. Unacceptable noise exposure is defined as a noise level above 75 dB (Day-night average sound level (DNL) in decibels). A Normally Unacceptable level is one above 65 dB but not exceeding 75 dB. These noise levels are to be based on noise from all sources, highway, railroad and aircraft.

Attenuation measures are normally required before projects in the Normally Unacceptable zone can be approved. Attenuation measures that reduce the external noise at a site are preferred, whenever practicable, over measures which only provide attenuation for interior spaces. HUD's noise regulations also apply to modernization and rehabilitation. For major or substantial rehabilitation projects in the Normally Unacceptable and Unacceptable

noise zones HUD actively will seek to have noise attenuation features incorporated into the project. In the Unacceptable noise zones, HUD will strongly encourage conversion of noise exposed sites to more compatible land uses.

HUD also requires that Comprehensive Planning Assistance grantees give adequate consideration to noise as an integral part of the urban environment with particular emphasis being placed on the importance of compatible land use planning in relation to airports, highways and other sources of high noise. Recipients of community development block grants under Title I of the Housing and Community Development Act of 1974 must also take into consideration the noise criteria and standards in the environmental assessment process.

#### **Environmental Protection Agency (EPA)**

The EPA's Noise program is designed to provide leadership to the national noise abatement effort. The key statutory mandates under which EPA operates are the Noise Control Act of 1972 (PL92-574) and the Quiet Communities Act of 1978 (95-609).

Until recently, EPA's Program has concentrated its efforts in setting noise source emission standards for various products, including transportation vehicles, construction equipment and consumer products. EPA also proposes aircraft/airport regulations to the FAA following a special procedure specified in the Noise Control Act of 1972.

Key to these efforts have been EPA reports defining scientifically the relationships between noise level and human response. The EPA "Levels" Document established threshold levels of impact which, if met, would protect the public "with an adequate margin of safety". As noted in Table 4, while these levels have relevance for planning, they, in themselves, are *not* necessarily appropriate land use planning criteria because they do not consider cost, feasibility, or the development needs of the community.

The emphasis of EPA's program today is on assisting cities, States and others to develop and carry out effective noise programs through various approaches, including noise and land use. In addition to a new grants program under the Quiet Communities Act, EPA has initiated such technical assistance programs as The Quiet Communities Program (QCP) and Each Community Helps Others (ECHO). The QCP is a program focusing EPA guidance and fiscal resources on target communities to achieve total community involvement and action. The ECHO program provides technical assistance to local communities on specific noise problems consulting services from officials of communities who have successfully overcome similar problems. Various other programs emphasizing provision of information on noise to various publics are also being developed and carried out.

#### **Department of Transportation/Federal Aviation Administration (DOT/FAA)**

The Federal Aviation Administration's noise program is guided by the 1976 Aviation Noise Abatement Policy and the Aviation Safety and Noise Abatement Act of 1979. The policy defines the responsibilities of the FAA, airport proprietors and users, and land use planning and control authorities in achieving and maintaining airport noise compatibility. The FAA uses two major approaches to implement this policy. The first is aimed at reducing

the noise of the individual aircraft. This includes a program to retrofit engines or equipment on noisy aircraft or to replace them with newer, quieter aircraft. It also includes the development of operational procedures which can reduce the aircraft's noise impacts.

The other major approach to noise compatibility is through planning and development activities at airports under the Airport and Airway Development Act of 1970 (as amended). Airport Noise Control and Land Use Compatibility (ANCLUC) planning studies integrate the master planning study activities, the environmental considerations, and the airport-land use compatibility planning activities at an airport. The objective is to achieve maximum noise and environmental compatibility within the constraints of safety, service, and economic viability. The plan may contain operational controls as well as physical improvements for the airport. It will also recommend, based upon a comprehensive study effort, land uses and strategies for land use control for areas around the airport impacted by noise. FAA's advisory circular, Airport-Land Use Compatibility Planning (AC 150/5050-6), serves as the basic guidance for the land use compatibility portion of an ANCLUC study.

The Aviation Safety and Noise Abatement Act of 1979 strengthens the FAA's noise policy by providing assistance to airport operators to prepare and carry out noise compatibility programs and providing incentives for replacing noisy aircraft with new technology aircraft. In compliance with this Act, the FAA will develop and promulgate an amendment to Part 150 of the Federal Aviation Regulations which will standardize airport noise abatement plans and provide for their review, specify standard noise metrics for use in airport noise assessments, and identify compatible land uses.

#### **Department of Transportation/Federal Highway Administration (DOT/FHWA)**

As a result of the Federal Aid Highway Act of 1970<sup>1</sup>, the Federal Highway Administration (FHWA) is concerned with traffic and construction noise associated with Federal aid highways. Since 1972, FHWA has had a noise policy applicable to new highway construction. The focus of the policy is to elevate the consideration of noise exposure in Federal-Aid highway location and design decisions by requiring substantive study of future noise exposure in conjunction with standards featuring highway design noise levels. (These levels have a very specific purpose which is explained in Table 4. Since 1976, FHWA's policy has also provided for noise mitigation on existing Federal aid highways. The principal noise mitigation measure has been placement of barriers at noise sensitive locations.

FHWA also recognizes and supports other approaches to highway noise control. Although in the source control area FHWA's authority is limited to implementing interstate motor carrier noise standards issued by EPA, it supports legislation to reduce the noise levels of motor vehicles. In the land use area its authority (like that of the other Federal agencies discussed here) is limited to providing information and guidance.<sup>2</sup>

The FHWA noise policy applies to the Federal Highway program which (unique among the policies discussed here) is a state administered program receiving Federal assistance. The noise policy is actually carried out as part of the overall environmental assessment process required by the National Environmental Policy Act. For each new highway, FHWA

<sup>1</sup>Act amended in 1973 and 1976.

<sup>2</sup>FHWA's key document in this area is *The Audible Landscape* (1974).

requires that state highway agencies furnish localities information on noise and land use. Furthermore, FHWA will normally not approve funds for barrier construction for areas which have become sensitive after May 24, 1976, unless localities have instituted land use controls over the remaining undeveloped lands adjacent to the highways.

#### **Veterans Administration (VA)**

The Veterans Administration (VA) policy for consideration of noise and land use planning is contained in separate statements. One statement is for the VA's Loan Guaranty Program and the other is for both the Department of Medicine and Surgery (DM&S) and the Department of Memorial Affairs (DMA).

The VA Loan Guaranty noise policy governs VA decisions as to whether residential sites in airport environs are "acceptable" for loan guaranty programs to eligible veterans and active duty personnel.

The VA Loan Guaranty noise policy features a set of three noise zones. In the case of new construction, all new developments located in the two higher zones generally are not eligible for VA assistance. There is flexibility in that if a local officer recommends acceptance, the VA Central Office will consider the case in light of geographic factors and proposed attenuation features,<sup>1</sup> as well as marketability. In the middle zone, it, therefore, may be possible to develop properties which will be acceptable for VA loans.

In all cases (existing as well as proposed properties) for sites located in the two higher zones, VA requires that a statement from each veteran purchaser be obtained indicating awareness that (a) the property being purchased is located in an area adjacent to an airport, and (b) the aircraft noise factor may affect normal liveability, value and saleability of the property.

The VA's Loan Guaranty Service conducts its business with veteran purchasers, lenders, builders and other sellers who are interested in VA's guaranty of the loan to an individual veteran purchaser. The Loan Guaranty Service rarely has any direct interaction with local authorities.

The policy for land acquisition and maintenance adhered to by DM&S and DMA considers noise in the environmental planning of all acquisition and construction programs. All new VA Medical Centers, domiciliaries, and other medical facilities are compatible or have been designed with noise attenuation features allowing them to be compatible with zones as defined in Table 2. All new VA National Cemetery Construction has generally been limited to Noise Zones A & B as described on Table 2 because of the nature of outdoor services. Guidelines for planning state facilities which are eligible for grant funds from DM&S or DMA programs are slightly relaxed leaving latitude to local conditions in planning requirements.

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<sup>1</sup>Such as soundproofing, year round air conditioning and other treatment.

## Appendix A

### EXPLANATION OF ENVIRONMENTAL NOISE DESCRIPTORS

This appendix discusses various descriptors that Federal agencies have used to assess environmental noise. These descriptors can be categorized as to whether they are applicable to 1) all sources or 2) airport only.

#### 1) *Applicable to all sources*

##### A. *Day Night Average Sound Level (DNL; scientific notation $L_{dn}$ )*

Day-Night average sound level<sup>1</sup>, abbreviated as DNL and symbolized as  $L_{dn}$ , is the 24 hour average sound level, in decibels, for the period from midnight to midnight, obtained after addition of 10 decibels to sound levels in the night from midnight to 7 a.m. and from 10 p.m. to midnight. DNL is a measureable quantity and can be measured directly at a specific location, using portable monitoring equipment<sup>2</sup>. (When it is measured it is not necessary that the measurement begin at midnight.)

##### B. *Equivalent sound level ( $L_{eq}$ )*

$L_{eq}$  is the average sound level<sup>1</sup>, in decibels, for any time period under consideration. If averaged over a 24 hour period, the only difference between it and DNL would be the 10 decibel night time weighting used in DNL.

In connection with its highway noise standards featuring design noise levels, FHWA uses an  $L_{eq}$  for the highway "design hour" as an alternative to the  $L_{10}$  descriptor. (The design hour is normally the 30th highest traffic volume occurring during the year.) Noise levels are predicted for the design year, which is normally 20 years from construction of the highway, and the noisiest hour of the day (usually the design hour). As indicated in Table II-1, under typical conditions the  $L_{eq}$  (design hour) approximately equals DNL.

<sup>1</sup>Average sound level — the level, in decibels, of the mean-square A-weighted sound pressure during a stated time period, with reference to the square of the standard reference sound pressure of 20 micropascals.

<sup>2</sup>It is important to note that  $L_{dn}$  contours derived from the use of noise prediction models do *not* necessarily reflect precise noise levels at specific locations. Typically, computer based airport noise prediction models forecast yearly average values for  $L_{dn}$ .

C.  $L_{10}$

While this descriptor applies to any noise source, FHWA is the only Federal agency using it (as an alternative to  $L_{eq}$ ).  $L_{10}$  is defined as the sound level that is exceeded 10 percent of the time for the period under consideration, which, in the case of FHWA, is the design hour. DNL under typical conditions approximately equals  $L_{10} - 3$  decibels.

D. *Community Noise Equivalent Level (CNEL)*

The CNEL, developed for the State of California, is almost identical to the DNL, except that it introduces an intermediate weighting for the early evening hours between 7:00 p.m. and 10:00 p.m. in addition to the weighting for the nighttime hours (10:00 p.m. to 7:00 a.m.). CNEL, like DNL, is a measurable quantity and can be measured directly. DNL is approximately equal to CNEL in almost all situations.

2) *Measures applying to airport sources only*

A. *Noise Exposure Forecast (NEF)*

The NEF was developed in 1967 as a refinement of the composite noise rating (CNR). It takes into account the factors considered by the CNR plus the additional exposure factors of the duration of aircraft flyovers and of discrete (pure) tones such as turbine "whine". The NEF cannot be directly measured and requires a computer for noise contour development. DNL approximately equals  $NEF + 35$ .

#### REFERENCES FOR APPENDIX A

1. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety; Environmental Protection Agency; Report No. 550/9-74-004; March 1974 (document for sale by U.S. Government Printing Office, Stock No. 055-000-00120-1, \$2.10).*  
This document gives the technical basis for the  $L_{dn}$  and  $L_{eq}$  noise descriptors.
2. *Federal-Aid Highway Program Manual 7-7-3, Federal Highway Administration, May 14, 1976, Washington, D.C.*  
This document describes FHWA's design noise levels which are expressed in  $L_{eq}$  and  $L_{10}$ .
3. *The Adopted Noise Regulations for California Airports, Title 4, Register 70, No. 48-11-28-70, Subchapter 6, Noise Standards (distributed by Documents Section, State of California, P.O. Box 20191, Sacramento, California 95820).*  
Describes CNEL.
4. *Noise Exposure Forecast: Evolution, Evaluation, Extensions, and Land Use Interpretations; W.J. Galloway and D.E. Bishop; Bolt, Beranek, and Newman, Inc.; Report No. FAA-No.-70-9; August 1970 (available through the National Technical Information Service, Springfield, Virginia 22151, No. AD 717-131, \$5.25).*

5. *Procedures for Developing Noise Exposure Forecast Areas for Aircraft Flight Operations*; D.E. Bishop and R.D. Horonjeff; Bolt, Beranek and Newman, Inc.; Report No. DS-67-10; August 1967 (available through the National Technical Information Service, Springfield, Virginia 22151, No. AD 660-706, \$5.25).

These documents are basic references for the Noise Exposure Forecast.

6. *Land Use Planning Relating to Aircraft Noise*; W.J. Galloway and A.C. Pietrasanta; Bolt, Beranek, and Newman, Inc.; Technical Report No. 821; October 1964 (available through the National Technical Information Service, Springfield, Virginia 22151, No. AD-615-015, \$5.25).

This document describes the CNR methodology (which is no longer in general use).

## **Appendix B**

### **ANNOTATED BIBLIOGRAPHY OF FEDERAL DOCUMENTS RELATED TO NOISE AND LAND USE ACTIVITIES**

The purpose of this bibliography is to provide aid to all persons involved in noise and land use planning and decision making, including planners, elected officials, facility and land managers, the private development community and the general public.

This bibliography discusses only Federal agency publications which are relevant to noise and land use activities. A much more extensive list would result were Federal publications included which cover other noise subject areas of interest to State and local agencies (e.g., highway noise mitigation, construction noise, aircraft source regulation, etc.).

The bibliography is organized into two parts. The first part covers Federal noise regulations, guidance tools and manuals and special studies. The second part discusses relevant Congressional statutes.

#### **Noise/Land Use Bibliography — Part I**

##### **DEPARTMENT OF DEFENSE (DOD)**

1. "Air Installations Compatible Use Zones," Department of Defense Instruction 4165.57, 8 November 1977.

This regulation sets forth the broad requirements for the Air Installations Compatible Use Zones (AICUZ) program while leaving implementation to individual military services.

2. "Intergovernmental Coordination of Defense Land and Facility Plans and Projects," Department of Defense Directive 4165.61, 16 December 1976.

This directive gives DOD's intergovernmental coordination policy.

3. "Planning in the Noise Environment," Air Force Manual 19-10, TM-5-803-2 (Army), and NAVFAC P-970 (Navy), 15 June 1978.

This is a noise description, reduction and planning handbook; includes noise and land use guidelines.



4. "USAF Air Installation Compatible Use Zone (AICUZ) Policy," June 1979.  
This document contains the U.S. Air Force AICUZ policy.
5. USAF Air Installation Compatible Use Zone (AICUZ) Handbook (Environmental Planning Bulletin 10) 2 Volumes, June 1979.  
This contains the procedures and guidelines for preparing AICUZ studies.
6. "Interagency/Intergovernmental Coordination of Land, Facility and Environmental Plans, and Programs." Air Force Regulation 19-9, 1980.  
This is the USAF's AICUZ and interagency/intergovernmental coordination policy.
7. "Air Force Handbook for Installation Coordination with Civilian Agencies: (Interim Environmental Planning Bulletin 14), two volumes, January 1978.  
This contains USAF's procedures for intergovernmental coordination at the local, regional and State levels.
8. "Air Force Handbook for Federal Agency Coordination" (Interim Environmental Planning Bulletin 15), January 1978.  
This contains procedures for Federal agency coordination; includes Federal agency directory.
9. "Intergovernmental Coordination of Department of the Navy Land Facility Plans, Projects, and Program," OPNAVINST 11010.35, 1979, U.S. Navy.  
This contains Navy intergovernmental coordination policy and procedures.
10. "Air Installation Compatible Use Zone Program (AICUZ)," OPNAVINST 11010.36, 1979, U.S. Navy.  
This contains Navy policy, procedures and guidelines for carrying out the AICUZ program at Navy and Marine Corps installations.
11. "Air Force Directory of State Environmental Planning Agencies," October 1977.  
Lists approximately 1300 State agencies.
12. "Air Installation Compatible Use Zone Studies," U.S. Air Force and U.S. Navy.  
These studies are published for each air installation.

#### **ENVIRONMENTAL PROTECTION AGENCY (EPA)**

1. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*, Environmental Protection Agency, Washington, D.C. (EPA 550/9-74-004), March 1974.  
This document is a scientific statement of threshold protective levels of noise without consideration of cost or feasibility or the needs of the community in any specific condition.

2. *Public Health and Welfare Criteria for Noise*, Report No. 550/9-73-002, Environmental Protection Agency, Washington, D.C., July 1973.  
This document contains published descriptive data on the effects of noise which might be expected from various levels and exposure situations.
3. *Model Community Noise Control Ordinance*. Environmental Protection Agency, September 1975.  
This model is intended as a basic tool for use by communities of various sizes in the development of noise control ordinances, (which can include land use provisions) tailored to their specific local conditions and goals.
4. *State and Municipal Noise Control Activities, 1973-74*. Environmental Protection Agency, Washington, D.C., January 1976.  
This report presents an assessment of the status of State and local noise control efforts and is intended as a reference guide for public administrators.
5. *Federal Noise Program Report Series: Volume I, Department of Defense: Air Installations Compatible Use Zones (AICUZ) Program*, Environmental Protection Agency, Washington, D.C., April 1977. (EPA 550/9-77-353).  
This report describes the features and problems of DOD's AICUZ program.
6. *Federal Noise Program Report Series: Volume II, Department of Housing and Urban Development: Noise Abatement and Control Policy*, Environmental Protection Agency, Washington, D.C., April 1977.  
This report discusses the features and problems associated with HUD's Noise Policy.
7. *Federal Noise Program Report Series: Volume III, Department of Transportation, Federal Highway Administration: Noise Policy and Related Environmental Procedures*, Environmental Protection Agency, Washington, D.C., July 1977. (EPA 550/9-77-357).  
This report describes the features and problems associated with FHWA's noise policy and related environmental procedures.
8. *Calculation of Day-Night Levels  $L_{dn}$  Resulting from Civil Aircraft Operations*. Environmental Protection Agency, Washington, D.C., January 1977.  
This report gives manual techniques for predicting aircraft noise levels in the environs of specific airports.

#### GENERAL SERVICES ADMINISTRATION (GSA)

1. *Compatible Land Uses at Federal Airfields*. Federal Management Circular 75-2: General Services Administration, 1975.  
This circular prescribes the Executive Branch's general policy with respect to achieving compatible land uses on either public or privately owned property at or in the vicinity of Federal airfields.

## DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

1. *"Environmental Criteria and Standards, Noise Abatement and Control, 24 CFR, Part 51, Subpart B,"* U.S. Department of Housing and Urban Development, July 12, 1979.  
This is the basic noise policy with quantitative noise standards and implementation procedures.
2. *Noise Assessment Guidelines.* W.J. Galloway and T.J. Schultz, Bolt, Beranek and Newman, Inc., prepared for the U.S. Department of Housing and Urban Development, 1980.  
These are guidelines for use in implementing the HUD noise regulation. They provide a tool for persons without acoustical training to perform preliminary estimates of the noise exposure at a site in relation to the HUD standards.
3. *HUD Noise Assessment Guidelines Technical Background.* W.J. Galloway and T.J. Schultz, Bolt, Beranek and Newman, Inc., prepared for the U.S. Department of Housing and Urban Development, 1980.  
This report discusses the need for noise abatement, the various techniques for measuring and describing noise and human responses to it. It gives technical background information for the development of site noise assessment techniques.
4. *Aircraft Noise Impact, Planning Guidelines for Local Agencies.* R. Dale Beland, Wilsey and Ham, Inc., prepared for the U.S. Department of Housing and Urban Development, 1972.  
This manual, based upon information developed in joint HUD-DOT studies and other case studies of aircraft noise abatement, provides a tool for local planners, local governments and others in developing a comprehensive aircraft abatement program through land use planning. GPO order number 2308-00214, NTIS order number PB213-020. Some of the technical data is a bit dated, but in general, still very useful.
5. Metropolitan Aircraft Noise Abatement Policy Studies, U.S. Department of Housing and Urban Development, 1971.
  - a. MANAPS — O'Hare International Airport, Chicago, Ill., 1971.
  - b. MANAPS — Cape Kennedy Regional Airport, East Central Florida Planning Council, 1971.
  - c. MANAPS — J.F. Kennedy International Airport, N.Y., Tri-state Transportation Commission, 1971.
  - d. MANAPS — Bradley International Airport, Windsor Locks, Conn., Capitol Regional Planning Agency, 1971.
6. *Noise in Urban and Suburban Areas: Results of Field Studies.* Bolt, Beranek and Newman, prepared for the U.S. Department of Housing and Urban Development, 1967. National Technical Information Service order number PB210-849.  
This study identifies significant noise sources, other than aircraft, known to create disturbances within the home. It analyzes the results of a social survey made to determine community responses to traffic noise.

**DEPARTMENT OF TRANSPORTATION/Federal Aviation Administration (DOT/FAA)**

1. *"Aviation Noise Abatement Policy,"* DOT/FAA, November 1976.  
This discusses actions the Administrator of FAA and Secretary of DOT believe should be taken to reduce aviation noise impact on the people who live in areas surrounding airports. It defines the roles and responsibilities of airport operators, aircraft operators, affected communities and the FAA for noise compatibility.
2. *Airport-Land Use Compatibility Planning*, FAA Advisory Circular 150/5050-6, 1977.  
This is FAA's guidance for compatible land use planning in the vicinity of both new and existing airports. It provides ideas and techniques for planning as well as guidance which may be used in developing noise control plans as encouraged by the DOT/FAA Noise Abatement Policy of 1976.
3. *Airport Noise Control and Land Use Compatibility (ANCLUC) Planning under the Planning Grant Program*, FAA Order 5900.4, 1977.  
This document provides programming and planning guidance for ANCLUC planning.
4. *Noise Control Plans*, FAA Order 1050.11, 1977.  
This document provides FAA policy and procedures for airport noise control plans.
5. *Citizen Participation in Airport Planning*, FAA Advisory Circular 150/5050-4, 1975.  
This circular provides guidances for citizen involvement in airport planning.
6. *Policies and Procedures for Considering Environmental Impacts*, FAA Order 1050.1C, 1979.  
This order covers FAA procedures for environmental assessments for all FAA project actions.
7. *Airport Environmental Handbook*, FAA Order 5050.4, 1980.  
This order covers procedures for airport actions.
8. *Impact of Noise on People*, Federal Aviation Administration, Washington, D.C., 1977.  
This document summarizes known information concerning public health and welfare effects and reactions.
9. *Five Year Environmental Plan 1978-1982*, Federal Aviation Administration.
10. *Airport Development Aid Program Handbook*, FAA Order 5100.36, 1979.
11. *Certified Airplane Noise Levels*, FAA Advisory Circular 36-1B, December 1977.  
This circular provides noise level data for airplanes certified under FAR Part 36 since its publication on November 18, 1969.

12. *Estimated Airplane Noise Levels in A-Weighted Decibels, AC 36-3A, June 11, 1980.*  
This circular provides listings of both certificated and uncertificated aircraft noise levels in A-weighted decibels, both ranked in descending order and listed by aircraft manufacturer. These values are intended to provide a consistent basis for comparison of noise levels of major aircraft models rather than of individual aircraft. Ranking of aircraft noise levels that occur under uniform Federal Aviation Regulation Part 36 certification conditions provides the best information currently available on the relative noisiness of civil aircraft over a wide variety of conditions.
13. *Integrated Noise Model, Version 1, January 1978.* Federal Aviation Administration.  
This report discusses the model and its uses.
14. *FAA INM Basic User's Guide, Version 2, 1979.* Federal Aviation Administration.  
This report contains the procedures for use of the Integrated Noise Model. (INM)
15. *INM Installation Manual, 1978.* Federal Aviation Administration.  
This report contains instructions for installing the INM program.
16. *Report to Congress, Study, Feasibility, Practicability and Cost of Soundproofing of Hospitals, and Public Health Facilities Near Airports.* Federal Aviation Administration, July 1977.  
This study, required by Section 26(3), Appendix B of the Airport and Airway Development Act Amendments of 1976 (P.C. 94-353), concludes that soundproofing of schools, hospitals, and public health facilities located near airports is a feasible and practicable means for alleviating aircraft noise impact.
17. *Planning for the Airport and its Environs: The Sea-Tac Success Story.* Federal Aviation Administration, Washington, D.C., April 1978.  
This is a case study of airport planning in the environs of Sea-Tac Airport, Washington. It constitutes guidance for other communities upset with airport noise incompatibility problems.
18. *Community Involvement Manual, FAA-EE-79-06, 1979.*  
This report gives additional guidance for conducting citizen participation activities.
19. *Developing Noise Exposure Contours for Federal Aviation Airports.* DOT-FA-75WA-3710, NTIS No. ADA 023429. December 1975.  
This report presents a "desk top" method for developing noise contours for airports other than air carrier airports.

**DEPARTMENT OF TRANSPORTATION/Federal Highway Administration  
(DOT/FHWA)**

1. *"A Statement of National Highway Transportation Policy,"* page 21, paragraph 2, Federal Highway Administration, December 1976, Washington, D.C.  
This document sets forth FHWA's policy on highway traffic noise. Noise control mitigation, land use and source control are discussed.
2. *"Federal-Aid Highway Program Manual 7-7-3,"* Federal Highway Administration, Washington, D.C., May 14, 1976.  
This document contains FHWA's noise standards for highways and requirements for Federal participation in highway noise mitigation.
3. *"The Audible Landscape: A Manual for Highway Noise and Land Use,"* Federal Highway Administration, Washington, D.C., November 1974, (Reprinted — August 1976).  
This document discusses various land use control techniques which communities can use in highway environs.
4. *Determination of Reference Energy Mean Emission Levels,* FHWA-OEP/HEV-78-1. Reagan, Jerry A., prepared for the Federal Highway Administration, Washington, D.C., July 1978.  
This report provides guidance for measurement of noise emission levels of motor vehicles and for using this measured data to compute reference energy mean emission levels.
5. *Highway Noise Barrier Selection, Design and Construction Experiences, Implementation Package 76-8,* Federal Highway Administration, Region 10. Snow, C.H., prepared for U.S. Department of Transportation, FHWA, Offices of Research and Development, Office of Engineering, Office of Environmental Policy, Washington, D.C., October 1976.
6. *Insulation of Buildings Against Highway Noise.* Davy, Bruce A. and Skale, Steven R., Wyle Research. Prepared for U.S. Department of Transportation, Federal Highway Administration, Office of Development, FHWA-TS-77-202. Washington, D.C., 1977.  
This manual provides highway engineers tools to assess the noise insulation requirements of buildings, to determine the effectiveness of existing buildings in insulation of interior space against highway traffic noise, and to evaluate the effectiveness of proposed modifications.
7. *A Guide to Visual Quality in Noise Barrier Design, Implementation Package 77-12.* Blum, Randolph F., The Organization for Environmental Growth, Inc., Prepared for the U.S. Department of Transportation, Office of Research and Development. Washington, D.C., July 1978.  
This report deals with the esthetic considerations of noise barrier design.

8. *Background Report on Outdoor-Indoor Noise Reduction Calculation Procedures Employing the Exterior Wall Noise Rating (EWNr) Method.* Mange, Gary E.; Skale, Steven R.; and Sutherland, Louis C., Wyle Research. Prepared for the U.S. Department of Transportation, Federal Highway Administration, Office of Development, Report No. FHWA-TS-77-220, Washington, D.C., March 1978.

This is a background report on the procedures for evaluating outdoor-indoor noise reduction of structure in terms of the single number metric Exterior Wall Noise Rating (EWNr).

9. *Fundamentals and Abatement of Highway Traffic Noise.* Anderson, G.S.; Miller, L.N.; and Shadley, Fr. R., Bolt, Beranek and Newman, Inc. Prepared for U.S. Department of Transportation, FHWA, PB-222-703/1. Washington, D.C., June 1973.
10. *FHWA Highway Traffic Noise Prediction Model.* Barry, T. and J. Reagan, FHWA-RD-77-108, Federal Highway Administration, Washington, D.C., December 1978.

This draft report describes FHWA traffic noise model. A predicted sound level can be calculated through a series of manual adjustments to the reference energy mean emission level.

#### **VETERANS ADMINISTRATION (VA)**

1. Veterans Administration, "*Section VIII Appraisal of Residential Properties Near Airports, 1969.*"

This contains the VA noise policy.

#### **Noise/Land Use Bibliography — Part II**

##### **KEY CONGRESSIONAL STATUTES RELEVANT TO NOISE AND LAND USE**

- Aviation Safety and Noise Abatement Act of 1979.  
This Act directs the Secretary of Transportation to take specific actions with respect to airport noise reduction.
- Quiet Communities Act of 1978.  
This Act directs the Environmental Protection Agency to assist States and Communities in carrying out their own noise control programs through the administration of a nationwide Quiet Communities Program.

- **Federal Aid Highway Act of 1970, and 1973 and 1976 amendments.**  
This series of legislation contains provisions directing the Federal Highway Administration to take specific actions with respect to highway noise, including the development and carrying out of noise standards for new highway construction and providing funding for noise mitigation on existing highways.
- **Airport and Airways Development Act of 1970 and 1976 amendments.**  
This legislation provides the Federal Aviation Administration's Grants Programs for airport planning and development including noise compatibility planning and sharing in the costs of certain airport noise abatement measures and activities.
- **Noise Control Act of 1972.**  
This Act requires all Federal agencies to carry out their programs in a manner so as to promote an environment free from noise that jeopardizes the health and welfare of the American public, and directs the Environmental Protection Agency to undertake certain noise abatement activities, including setting noise standards and furnishing technical assistance to State and local governments.
- **National Environmental Policy Act of 1969.**  
This Act requires that for all proposed Federal actions significantly affecting the quality of the environment, Federal agencies should prepare an environmental impact statement concerning the proposed action.
- **Federal Aviation Act of 1968 and 1972 amendments.**  
This law constitutes the basic authority for Federal regulation of Aircraft noise.
- **The Department of Housing and Urban Development Act of 1965.**  
This law provides that the Department of Housing and Urban Development may make such rules as may be necessary to carry out its duties and sets forth, as a matter of national purpose, the sound development of the Nation's communities.



## Appendix C

### ANNOTATED BIBLIOGRAPHY OF FEDERAL MANUALS AND OTHER DOCUMENTS RELATED TO NOISE ATTENUATION IN BUILDINGS

#### DEPARTMENT OF COMMERCE/National Bureau of Standards (DOC/NBS)

1. *Quieting: A Practical Guide to Noise Control*. Berendt, Raymond D., Corliss, Edith L.R. and Ojalvo, Morris, S., U.S. Department of Commerce, July 1976.

This guide offers to the general lay reader practical solutions to various noise problems including recommendations for techniques for quiet in existing homes as well as for choosing a quiet home or apartment.

2. *Design Guide for Reducing Transportation Noise in and Around Buildings*. Pallett, David S., Wehrli, R., Kilmer, Roger D., and Quindry, Thomas L., U.S. Department of Commerce/National Bureau of Standards, April, 1978.

This design guide presents a unified procedure for the selection of noise criteria in and around buildings, for the prediction of exterior and interior noise levels arising as a consequence of transportation systems operations, and for the evaluation of the adequacy of building designs with regard to environmental noise. Noise criteria levels are suggested in terms of equivalent sound levels ( $L_{eq}$ ). Simplified predictive methods enable the estimation of noise levels from highways, railways, and aircraft. The sound isolation provided by the building shell is estimated by means of a new single-figure rating system. Finally, the manual suggests design manipulations which may make possible the improvement of the acoustic conditions in and around buildings.

3. *Acoustical and Thermal Performance of Exterior Residential Walls, Doors and Windows*. Sabine, H.J., Lacher, M.B., Flynn, D.R., and Quindry, T.L., U.S. Department of Commerce, November 1975.

This manual is intended to assist in achieving improved design when both noise and energy conservation are to be considered. It describes the results of laboratory tests (109 acoustical, 48 thermal) conducted on typical residential exterior wall constructions and compares them with literature data on similar constructions.

4. *Noise Criteria of Buildings: A Critical Review*. Yaniv, Simone I. and Flynn, D.R., U.S. Department of Commerce, January, 1978.

This report reviews existing criteria that could be applied to rating the noise environment in dwellings, and to rating noise isolation from outside to inside a dwelling. It concludes that the central problem is to select appropriate criteria for rating the interior noise environment. Once this is done, criteria for noise isolation can be derived directly and these in turn can be used to derive performance requirements for building elements, such as partitions and exterior walls.

#### DEPARTMENT OF DEFENSE (DOD)

1. *"Air Installation Compatible Use Zone Studies,"* U.S. Air Force and U.S. Navy.  
A standard appendix in each study gives recommendations for design and construction techniques for primarily residential construction to achieve various levels of noise reduction corresponding to the land use guidance contained in the main document.
2. *"Planning in the Noise Environment,"* Air Force Manual 19-10, TM-5-803-2 (Army), and NAVFAC P-970 Navy), 15 June 1978.  
This manual is a tool for installation planners to assist them in developing acceptable noise environments on military installations; contains some information on building acoustics.
3. TM-5-805-15, *U.S. Army Technical Manual on Architectural Acoustics*.  
This manual contains design information to provide occupant with satisfactory acoustical conditions within and protection from noise that may be injurious to health or welfare. Provides recommended techniques for reducing unwanted sounds.
4. *Facility Acoustic Parameters' Catalog*. Naval Environmental Support Service (AESO 330-76-02), January 1977.  
This provides a fundamental knowledge of architectural acoustics. Provides techniques for determination of Sound Transmission Class (STC) and composite transmission loss and for relating noise reduction to STC. Provides absorption and transmission loss data.
5. *Noise Reduction Technology Catalog*. Naval Environmental Support Service, AESO Report 330-70-01, January 1977.  
This report provides a fundamental acquaintance with the properties of noise and various techniques applicable to noise control. Provides absorption and transmission loss data for common building materials.

**DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)**

1. *A Guide to Airborne, Impact, and Structure Borne Noise-control in Multi-family Dwellings*. Berendt, Raymond D., Winzer, George E., and Burroughs, prepared for U.S. Department of Housing and Urban Development, September 1961. NTIS order number PB210-849.

This Guide incorporates a broad range of criteria appropriate for isolating airborne, impact, and structure-borne noise associated with residential construction. Sound classifications represented in the most common types of building construction are identified.

**DEPARTMENT OF TRANSPORTATION/Federal Aviation Administration  
(DOT/FAA)**

1. *"The Feasibility, Practicability and Cost of the Soundproofing of Schools, Hospitals, and Public Health Facilities Near Airports,"* Federal Aviation Administration, 1977.

This study, required by Section 26(3), Appendix B of the Airport and Airway Development Act Amendments of 1976 (P.C. 94-353), concludes that soundproofing of schools, hospitals, and public health facilities near airports is a feasible and practicable means for alleviating aircraft noise impact.

**DEPARTMENT OF TRANSPORTATION/Federal Highway Administration  
(DOT/FHWA)**

1. *Insulation of Buildings Against Highway Noise*. Davy, Bruce A. and Skale, Steven R., Wyle Research, prepared for U.S. Department of Transportation, Federal Highway Administration, Office of Development, FHWA-TS-77-202. Washington, D.C., 1977.

This manual provides highway engineers with the necessary tools to assess the noise insulation requirements of buildings, to determine the effectiveness of existing buildings in insulating interior space against highway traffic noise, and to evaluate the effectiveness of proposed modifications.

2. *Background Report on Outdoor-Indoor Noise Reduction Calculation Procedures Employing the Exterior Wall Noise Rating (EWNr) Method*. Mange, Gary E.; Skale, Steven R.; and Sutherland, Louis C., Wyle Research. Prepared for U.S. Department of Transportation, Federal Highway Administration, Office of Development, Report No. FHWA-TS-77-220, Washington, D.C., March 1978.

This is a background report on the procedure for evaluating outdoor-indoor noise reduction of structure in terms of the single number metric Exterior Wall Noise Rating (EWNr), first reviews the basis of previous single number ratings emphasizing the Sound Transmission Class (STC). It is shown that the latter was initially designed to try to account for the relative loudness of interior noises in typical residences as heard by adjoining neighbors on the other side of a common party wall.

In a similar, but quite independent manner, the EWNR metric was developed so that the A-weighted indoor noise level, due to highway noise sources outdoors, could be roughly estimated directly from the value of EWNR and the A-weighted outdoor noise level. The basis for this is defined, first in terms of the basic theory for noise reduction from outdoors to indoors at one frequency. The result is then summed over all frequencies to give the overall effective noise reduction. The EWNR single number rating replaces this complex summation and, as shown by recently conducted field tests, provides a valid method with an accuracy of about  $\pm 3$  dB for predicting levels inside buildings due to outdoor transportation noise sources.

This background report also briefly reviews the basis for the tables of EWNR values and tables of various EWNR adjustment factors used to evaluate the composite noise reduction of A-weighted noise levels for a wide range of practical residential structural assemblies which may include walls, windows, doors, roofs, and ceilings.

3. *Guide to the Soundproofing of Existing Homes Against Exterior Noise*. Wyle Research, prepared for city of Los Angeles Department of Airports (1970). Reprinted with permission by Federal Highway Administration, Office of Development, 1977.

This manual is for the designer in selecting and conceptualizing various methods of soundproofing existing homes. This guide presents the various successful methods used in a 1970 pilot project to increase the noise reduction capabilities of existing houses for the Los Angeles Department of Airports. Three categories of modification from minor to extensive are covered. The guide also provides a basic understanding of the elements of noise control and the systematic method of soundproofing houses. This guide expands the repertory of methods and techniques of reducing the impact of highway traffic noise on its neighbors.

#### DEPARTMENT OF AGRICULTURE (DOA)

1. Jones, R.E., "Effects of Flanking and Test Environment on Lab Field Correlation of Airborne Sound Insulation," *Journal of the Acoustical Society of America*, 57(5), 1975, 1138-1149.
2. Jones, R.E., "Field Sound Insulation Evaluation for Two Auxiliary Walls," USDA Forest Service Research Paper No. FPL-244, Forest Products Laboratory, Madison, WI, 1975.
3. Jones, R.E., "How to Accurately Predict the Sound Insulation of Partitions," *Sound and Vibration* 10(6), pp. 14-25, 1976; Errata *Sound and Vibration* 10(11), 1976, p. 15.
4. Jones, R.E., "Insulation Evaluation of Load Bearing Sandwich Panels for Housing," Forest Products Laboratory, Madison, WI., 1975 NTIS No. PB 244-152/AS.
5. Jones, R.E., "Laboratory-Field Correlation for Airborne Sound Transmission Through Party Walls," USDA Forest Service Research paper No. FPL-240, Forest Products Laboratory, Madison, WI., 1975.

**DEPARTMENT OF AGRICULTURE (continued)**

6. Jones, R.E., "Sound Insulation Evaluation of Several Single-Row-of-Wood Stud Party Walls Under Laboratory and Field Conditions, USDA Forest Service Research paper No. FPL-241, Forest Products Laboratory, Madison, WI., 1975.
7. Jones, R.E., "Sound Insulation of High Performance Wood Frame Party Partitions Under Laboratory and Field Conditions," USDA Forest Service Research paper No. FPL-309, Forest Products Laboratory, Madison, WI., April 1978.

## **Appendix D**

### **EFFECTS OF NOISE ON PEOPLE**

Environmental noise affects health and welfare in many ways. Table D-1 describes some aspects of the effect of noise on people in residential areas to varying levels of cumulative exposure. As stated in the main portion of this document, it can be used as an important input to the local land use decision making process. For a further discussion of the effects of noise consult the bibliography on the following page.

**TABLE D-1. EFFECTS OF NOISE ON PEOPLE  
(Residential Land Uses Only)**

Effects <sup>1</sup> Day-Night Average Sound Level in Decibels	Hearing Loss	Speech Interference		Annoyance <sup>2</sup> % of Population Highly Annoyed <sup>3</sup>	Average Community Reaction <sup>4</sup>	General Community Attitude Towards Area
		Indoor % Sentence Intelligi- bility	Outdoor Distance in Meters for 95% Sentence Intelligibility			
75 and above	May Begin to Occur	98%	0.5	37%	Very Severe	Noise is likely to be the most important of all adverse aspects of the community environment.
70	Will Not Likely Occur	99%	0.9	25%	Severe	Noise is one of the most important adverse aspects of the community environment.
65	Will Not Occur	100%	1.5	15%	Significant	Noise is one of the important adverse aspects of the community environment.
60	Will Not Occur	100%	2.0	9%	Moderate to	Noise may be considered an adverse aspect of the community environment.
55 and below	Will Not Occur	100%	3.5	4%	Slight	Noise considered no more important than various other environmental factors.

1. "Speech Interference" data are drawn from the following tables in EPA's "Levels Document": Table 3, Fig. D-1, Fig. D-2, Fig. D-3. All other data from National Academy of Science 1977 report "Guidelines for Preparing Environmental Impact Statements on Noise, Report of Working Group 69 on Evaluation of Environmental Impact of Noise."

2. Depends on attitudes and other factors.

3. The percentages of people reporting annoyance to lesser extents are higher in each case. An unknown small percentage of people will report being "highly annoyed" even in the quietest surroundings. One reason is the difficulty all people have in integrating annoyance over a very long time.

4. Attitudes or other non-acoustic factors can modify this. Noise at low levels can still be an important problem, particularly when it intrudes into a quiet environment.

**NOTE:** Research implicates noise as a factor producing stress-related health effects such as heart disease, high-blood pressure and stroke, ulcers and other digestive disorders. The relationships between noise and these effects, however, have not as yet been quantified.

## HEALTH EFFECTS BIBLIOGRAPHY

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**Appendix E**

**FEDERAL AGENCY POINTS OF CONTACTS FOR  
ADDITIONAL INFORMATION**

**DEPARTMENT OF DEFENSE (DoD)**

1. Office of the Secretary of Defense
  - A. Deputy Assistant Secretary of Defense  
(Energy, Environment and Safety)  
Pentagon, Room 3E784  
Washington, D.C. 20301 (202) 695-0221
  - B. Deputy Assistant Secretary of Defense  
(Installations and Housing)  
Pentagon, Room 3E760  
Washington, D.C. 20301 (202) 695-7804
2. United States Army
  - A. U.S. Army Environmental Hygiene Agency  
Bioacoustics Division  
Aberdeen Proving Ground, Maryland 21010
  - B. Headquarters, Department of the Army  
DAEN-Z-CE  
Washington, D.C. 21010
  - C. Headquarters, Department of the Army  
DAEN-MPE-1  
Washington, D.C. 20314
  - D. Commander/Director  
CERL  
P.O. Box 4005  
Champaign, Illinois 61820

**DEPARTMENT OF DEFENSE (DoD) (continued)**

3. United States Navy

A. General:

Office of Chief of Naval Operations (OP-04E)  
Department of the Navy  
Washington, D.C. 20350

(202) 325-0090

B. Specific for Individual Installations

Commanding Officer of Installation involved

4. United States Air Force

A. General:

Environmental Division (AF/LEEV)  
Directorate of Engineering and Services  
Headquarters U.S. Air Force  
Washington, D.C. 20330

B. General — Standard Federal Regions I-IV:

Environmental Planning Division (AFRCE/ROV)  
USAF Regional Civil Engineer/Eastern Region  
526 Title Building  
Atlanta, GA 30303

C. General — Standard Federal Regions V-VIII:

Environmental Planning Division (AFRCE/ROV)  
USAF Regional Civil Engineer/Central Region  
Main Tower Building  
1200 Main Street  
Dallas, TX 75202

D. General — Standard Federal Regions IX-X:

Environmental Planning Division  
USAF Regional Civil Engineer/Western Region  
630 Sansome Street  
San Francisco, CA 94111

E. Specific for Individual Installations:

Environmental Planning Section (DEEV)  
Base Civil Engineer

**DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)**

**A. General:**

Director  
Environmental Planning Division  
Office of Environmental Quality  
451 7th Street, S.W.  
Washington, D.C. 20410 (202) 755-8909

**B. Specific for Individual Projects:**

**Environmental Clearance Officers in HUD Regional and Area Offices**

**ENVIRONMENTAL PROTECTION AGENCY (EPA)**

**A. Headquarters**

Office of Noise Abatement and Control  
Washington, D.C. 20460 (703) 557-7634

**B. Regions**

Region I  
JFK Building  
Boston, MA 02203 (617) 223-5708

Region II  
26 Federal Building  
New York, NY 10007 (212) 264-2110

Region III  
Curtis Building  
6th & Walnut Streets  
Philadelphia, PA 19106 (215) 597-9118

Region IV  
345 Courtland St., N.E.  
Atlanta, GA 30308 (404) 881-4861

Region V  
230 South Dearborn St.  
Chicago, IL 60604 (312) 353-2202

Region VI  
First International Bldg.  
1201 Elm Street  
Dallas, TX 75270 (214) 767-7242

Region VII  
324 East 11th Street  
Kansas City, MO 64106 (816) 374-3307

**ENVIRONMENTAL PROTECTION AGENCY (EPA) (continued)**

Region VII  
Lincoln Tower  
1860 Lincoln Street  
Denver, CO (303) 837-2221

Region IX  
215 Fremont Street  
San Francisco, CA 94105 (415) 556-4606

Region X  
1200 Sixth Avenue  
Seattle, WA 98101 (206) 442-1253

**DEPARTMENT OF TRANSPORTATION/Federal Aviation Administration (DOT/FAA)**

Headquarters

A. Office of Environment and Energy (AEE-100)  
800 Independence Ave., S.W.  
Washington, D.C. 20591 (202) 755-9468

B. Office of Airport Planning and Programming (APP-600)  
800 Independence Ave., S.W.  
Washington, D.C. 20591 (202) 426-3263

**DEPARTMENT OF TRANSPORTATION/Federal Highway Administration  
(DOT/FHWA)**

A. Headquarters  
Office of Environmental Policy  
400 Seventh Street  
Washington, D.C. 20590 (202) 426-0351

B. Regions

Regions I  
Leo W. O'Brien Federal Building  
Room 709  
Clinton Avenue and North Pearly Street (518) 472-6476  
Albany, NY 12207 FTS 562-6476

Region III  
George H. Fallon Federal Office Building  
31 Hopkins Plaza (301) 962-2361  
Room 1633 FTS 922-2361  
Baltimore, MD 21201

Region IV Suite 200 1720 Peachtree Road, N.W. Atlanta, GA 30309	(404) 881-4078 FTS 257-4078
Region V 18209 Dixie Highway Homewood, IL 60430	(312) 799-6300 FTS 370-9112
Region VI 819 Taylor Street Fort Worth, TX 76102	(817) 334-3221 FTS 334-3433
Region VII 6301 Rockholl Road P.O. Box 19715 Kansas City, MO 64131	(816) 926-7421 FTS 926-7421
Region VIII 555 Zang Street P.O. Box 24256 Denver, CO 80225	(303) 234-4051 FTS 234-4051
Region IX 2 Embarcadero Center P.O. Box 7616 Suite 530 San Francisco, CA 94111	(415) 556-3850 FTS 556-3366
Region X Mohawk Building, Room 412 222 S.W. Morrison Street Portland, OR 97204	(503) 221-2052 FTS 423-2071

#### **VETERANS ADMINISTRATION (VA)**

A. Headquarters 810 Vermont Ave., N.W. Washington, D.C. 20460	(202) 389-2249
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附件四：馬里蘭州政府噪音污染管制相  
關文件一

Maryland Department of Transportation

State Highway Administration



**MARYLAND DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION**

**SOUND BARRIER POLICY**



May 11, 1998



## POLICY SUMMARY

The Maryland State Highway Administration Noise Policy provides for the evaluation of sound barriers for communities adversely impacted by noise from state highways.

Sound barriers are evaluated in two separate categories. The first category is for the construction of new highways or capacity additions to existing highways (Type I). The second category is for existing highways not being expanded (Type II). The following eligibility criteria apply to each category.

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### Sound Barriers With New Construction or Expansion of a State Highway (Type I)

- Predicted future noise levels equal or exceed 66 decibels or exceed existing noise levels by 10 decibels or more.
- A sound barrier can be constructed that would reduce noise levels by 7-10 decibels at the most severely affected residences.
- The cost of the sound barrier does not exceed \$50,000/residence benefited.
- The majority of the impacted residences in the defined community must have existed prior to the date of approval of the proposed highway improvements. In making this determination, two cases will be examined.

- Case 1

If 50% or more of the impacted residences predate the approval of the proposed highway improvements, this criterion would be met. If less than 50% but more than 25% of the impacted residences existed before the approval date, SHA will look at the age of other residences in the community that are affected by highway noise under Case 2.

- Case 2

If more than 50% of the residences in the community that will be affected by highway noise in the design year as the result of the proposed highway improvements predate the approval of the highway improvements this criterion would be met. Affected is defined as experiencing noise levels in excess of 57 decibels. The use of the 57 decibels establishes the FHWA Category A criterion as the level at which noise begins to affect residential land uses for Case 2.

- Seventy-five percent of the residents that are impacted are in favor of a barrier.

## Sound Barriers on Existing Highways (Type II)

- The majority of the impacted residences must have existed prior to the construction of the original highway. In making this determination, two cases will be examined.

- Case 1

If 50% or more of the impacted residences predate the original highway improvements, this criterion would be met. If less than 50% but more than 25% of the impacted residences existed before the approval date, SHA will look at the age of other residences in the community that are affected by highway noise under Case 2.

- Case 2

If 50% or more of the residences in the community affected by existing noise levels predate the original highway improvements, this criterion would be met. Affected is defined as experiencing noise levels in excess of 57 decibels. The use of 57 decibels establishes the FHWA Category A noise level criterion as the level at which noise begins to affect residential land uses for Case 2.

- Measured noise levels equal or exceed 66 decibels.
- A sound barrier can be constructed that would reduce noise levels by 7-10 decibels at the most severely affected residences.
- The cost of the sound barrier does not exceed \$50,000/residence benefited.
- Seventy-five percent of the residents that are impacted are in favor of a barrier.
- Sound barriers will be approved only in counties that have enacted local controls, consistent with state requirements, to address noise impacts for future noise sensitive development adjacent to state highways.
- The local jurisdiction agrees to fund 20% of the project cost.
- Right of way that may be required for the construction or permanent location of a sound barrier is donated to the state.
- Highway is a limited access facility, where access is limited to interchanges.

**MARYLAND DEPARTMENT OF TRANSPORTATION  
STATE HIGHWAY ADMINISTRATION  
SOUND BARRIER POLICY**

It is the Maryland Department of Transportation, State Highway Administration's policy that decisions on where to provide sound barriers will be made after evaluation of the feasibility and reasonableness of barriers.

The Maryland State Highway Administration's (SHA) policy is applicable to projects funded with Federal and/or State funds. Sound barriers are evaluated in two separate categories. The first category (Type I) is for the construction of new highways or through lane capacity additions to existing highways. The second category (Type II) is for existing highways not being expanded.

**SOUND BARRIER FEASIBILITY AND REASONABLENESS**

The determination of feasibility and reasonableness of providing sound barriers will consider the following for both the Type I and Type II elements of the sound barrier program.

**FEASIBILITY**

Sound barrier feasibility is defined as the engineering and acoustical ability to provide effective noise reduction. Sound barrier feasibility will be based upon the following:

1. If noise levels cannot be reduced by at least 3 decibels at impacted receptors, a noise barrier will not be considered feasible. The noise reduction goal for receptors with the highest noise levels (first row receivers) is 7-10 decibels. If a noise reduction of 7-10 decibels cannot be achieved, the barrier will be considered not to be feasible. 噪源受体  
至噪声受体  
3分贝  
7-10分贝
2. If the placement of a sound barrier will restrict pedestrian or vehicular access or would cause a safety problem, such as limiting sight distance or reduction of a vehicle recovery area, the barrier will not be considered feasible. 安全距离
3. If the construction of a sound barrier will result in significant utility impacts, the barrier will not be considered feasible. Significant utility adjustments can have a major impact on barrier design options and construction costs. + 10 - 20 分贝

drainage

4. If construction of a sound barrier will have an impact upon existing drainage, it could be considered not to be feasible. Drainage is an important element in the location and design of a sound barrier. The potential for impact to drainage patterns and systems and flooding will be considered in the overall decision on whether construction is feasible and reasonable.

Only barriers that are determined to be feasible will be approved.

### **REASONABLENESS**

Each individual impact area will also be evaluated to determine if construction of a sound barrier is reasonable. Reasonableness will be based upon the following:

1. If 75% of the impacted residents do not approve the proposed sound barrier, the barrier could be considered not to be reasonable.
2. For Type I projects, if existing noise levels are expected to increase by 10 decibels or more, but will be less than 57 decibels, a sound barrier will be considered not to be reasonable.
3. For Type I projects, if a change over no-build levels of less than 3 decibels would result from a build condition, a sound barrier could be considered not to be reasonable. In the assessment of the no-build to build noise level change, consideration will be given to the cumulative effects of highway improvements made after the original highway construction. If the cumulative increase in design year build noise levels at noise sensitive receivers that existed when prior improvements were made is equal to or greater than 3 decibels, noise abatement could be considered reasonable.

If noise levels equal or exceed 72 decibels at impacted noise sensitive receivers, SHA will consider a sound barrier reasonable for any proposed highway expansion that will increase noise levels provided that other feasibility and reasonableness criteria are met.

4. If the cost of a sound barrier will exceed \$50,000 per benefited residence, the barrier will be considered not to be reasonable. The cost/residence is determined by the dividing the cost of a sound barrier by the total number of benefited residences. The total number of benefited residences will be the sum of the following:
  - a. The number of impacted residences that would receive a 3 decibel or greater noise reduction.
  - b. The number of non-impacted residences (noise levels below 66 dBA Leq) that would receive a 5 decibel or greater noise reduction.

- c. The number of impacted and non-impacted non-residential noise sensitive receivers (schools, churches, etc.) that would benefit from a sound barrier.

All benefited receptors will be included in the cost/residence calculation. Non-residential receptors such as schools, churches, historic areas, etc. will be considered as equivalent residences for cost/residence calculations, based upon 10 equivalent residences for each use.

Sound barrier cost is based upon the estimated cost of the barrier system, i.e. posts, panels, foundations and retaining walls required solely to support the sound barrier. The most recent five years of bidding experience will be used to calculate the square foot factor used to estimate barrier cost. If the cost of a barrier exceeds the \$50,000 maximum, SHA will fund up to the maximum, if the balance is available from another source or sources. SHA will work with the local jurisdiction on options for alternative funding.

For Type I projects, SHA will look at both the cost/residence for individual noise sensitive areas and the average cost/residence for the entire project in determining reasonableness. Noise sensitive areas with a cost/residence of less than \$100,000 would be included in the project cost averaging. If the average cost/residence for the project is less than \$50,000, sound barriers will be considered reasonable. **See example in Attachment 1.**

5. If a very tall sound barrier would have to be located close to the impacted receptors, and would have a negative visual impact, construction of the barrier could be considered not to be feasible. The relationship of the location of a sound barrier to the receptors to be protected will be considered in making a reasonableness determination.
6. If the construction of a sound barrier will result in an impact to a Section 4(f) resource, it could be determined not to be reasonable. Section 4(f) resources include publicly owned recreation areas and parks, wildlife areas, conservation areas and historic sites that are either on or considered eligible for the National Register of Historic Places.

Reasonableness will consider the significance of impact and the feasibility of avoidance. A 4(f) document will be prepared as required by federal regulations and consultation and coordination with those responsible for the resource will be carried out and documented.

7. The control of new development adjacent to state highways in high noise zones at the local level is critical to the overall abatement of highway noise. Sound barrier reasonableness will consider the local priority on approving new development adjacent to state highways in the determination of providing noise abatement for highway construction or reconstruction projects.

A feasibility and reasonableness worksheet will be completed for each noise sensitive area on both Type I and Type II projects. See Attachment 2. The worksheet for Type I projects will be initially completed during the environmental clearance phase of project development and finalized during and prior to the completion of final project engineering.

It is the SHA's policy to make final decisions on the construction of Type I sound barriers during the final design phase of project development, after final horizontal and vertical alignments are determined and a detailed engineering analysis of the feasibility and reasonability of noise abatement can be made. Barriers that meet the SHA criteria as accepted by FHWA will be constructed.

SHA will consider non sound barrier options for areas which meet the eligibility date criterion for consideration of a barrier but do not meet all of the remaining criteria for a barrier, including:

- Soundproofing of publicly owned noise sensitive structures, if interior noise levels equal or exceed 52 dBA, on a case by case basis consistent with Federal guidelines.
- Purchase of impacted residences on a case by case basis consistent with Federal guidelines.

SHA will consider the installation of landscape screening or privacy fencing for areas which meet the eligibility date criterion, but do not meet all of the remaining criteria for a barrier.

In addition to these general criteria, there are criteria that apply specifically to each of the two categories of sound barriers.

## **NEW HIGHWAY CONSTRUCTION OR RECONSTRUCTION (TYPE I)**

The analysis of noise impacts for highway improvement projects will consider the following:

### **ANALYSIS OF FUTURE NOISE IMPACTS**

Noise impacts will be analyzed for noise sensitive receptors (residences, schools, churches, historic sites) that existed prior to the approval of proposed highway improvements. Residences include all dwelling units. For buildings containing multiple housing units, each unit will be analyzed and considered as a separate receptor. Future noise levels will be projected for the design year, usually twenty years in the future, utilizing the latest approved FHWA noise prediction model.



Traffic noise analyses will be done for developed lands and undeveloped lands planned, designed and programmed if a noise sensitive land use, such as a residence, school, church, hospital, library, etc. has received a building permit from the local agency with jurisdiction at the time of project approval.

The date of public knowledge shall be the date that a project's environmental analysis and documentation is approved, i.e., the date of approval for the categorical exclusion, finding of no significant impact, or record of decision. After this date, the Maryland State Highway Administration is still responsible for analyzing changes in traffic noise impacts, when appropriate, but is no longer responsible for providing sound barriers for new development which occurs adjacent to the proposed highway project. Provisions for noise abatement for new development becomes the responsibility of the local jurisdiction and private developers.

### **IDENTIFICATION OF TRAFFIC NOISE IMPACTS**

A sensitive receptor is impacted if design year noise levels are projected to equal 66 dBA or if existing noise levels are projected to increase by more than 10 dBA and exceed 57 dBA. The Noise Abatement Criteria are shown in **Attachment 3**.

### **ABATEMENT OF TRAFFIC NOISE IMPACTS**

Noise abatement measures, i.e. sound barriers, earth berms or berm and wall combinations will be analyzed for all impacted receptors. For Type I projects, measures that are determined to be reasonable and feasible will be constructed with the highway project.

For Type I projects, SHA will consider constructing sound barriers, which meet the criteria for feasibility and reasonability, in advance of the highway project if:

- Existing noise levels at impacted receptors exceed 72 dBA;
- The local jurisdiction agrees to fund 20% of the sound barrier cost; and;
- All right of way required to construct the barrier(s) is donated to the State.

In making this decision, SHA will consider the timing of future improvements and the presence of local noise control ordinances for future developments.

### **SOUND BARRIERS ON EXISTING HIGHWAYS (TYPE II)**

The State Highway Administration will consider sound barriers for noise sensitive areas along existing highways, with full controls of access, where existing noise levels equal or exceed 66 decibels and:

- The majority of the impacted receptors existed before the original highway was constructed.
- A sound barrier(s) is reasonable and feasible.
- The local jurisdiction agrees to fund 20% of the project cost.
- All right of way required for the construction or permanent location of the sound barrier(s) is donated to the state.

Programming of Type II sound barriers that are reasonable and feasible will be based upon the availability of funds in the Consolidated Transportation Program (CTP).

### **APPEALS**

Appeals of decisions not to build sound barriers will be considered by the Secretary of the Department of Transportation, and the State Highway Administrator. An appeal would be reviewed when there is a question on interpretation or application of the noise policy criteria or the preparation and accuracy of the technical noise analysis. The noise policy criteria would not be a basis for appeal.

### **COORDINATION WITH LOCAL OFFICIALS**

Preventing noise sensitive land uses from locating adjacent to state highways within high noise areas is the responsibility of local land use and zoning processes. The control of highway noise, to be effective and comprehensive, must be done in partnership between SHA and local land use planning officials. The Maryland SHA will furnish the results of all highway traffic noise analyses to local government officials and will encourage local communities and developers to practice noise compatible development. Local coordination will specifically be accomplished through the distribution of highway project environmental documents and noise study reports.

It is the policy of SHA that new Type II sound barriers will only be approved if the local jurisdiction has implemented controls to prevent the construction of new noise sensitive development adjacent to state highways. SHA has examples of existing noise ordinances that can be considered by local officials.

SHA will provide assistance to local jurisdictions in the development of local noise controls. This assistance may be in the form of any of the following:

- Review of comprehensive plans, rezoning and site development plans.
- Information on present and future noise levels adjacent to state highways.
- Technical support in the development of local noise control programs.

Attachment 1  
Sound Barrier Cost Averaging Example

Ten communities will be impacted by highway traffic noise from proposed capacity improvements to an existing State highway. The noise analysis has determined that effective sound barriers can be constructed at all ten locations. The cost/residence at eight of the communities is less than \$50,000. The cost/residence at two of the communities is between \$50,000 and \$100,000. Application of the cost averaging principle would result in an average cost/residence spread across all ten communities of less than \$50,000. Barriers for all ten communities would be recommended.

Community	Residences Benefitted	Barrier Cost	Cost/Residence
1	30	\$800,000	\$26,700
2	40	\$1,100,000	\$28,000
3	20	\$820,000	\$41,000
4	45	\$1,500,000	\$33,000
5	15	\$975,000	\$65,000
6	12	\$750,000	\$62,500
7	35	\$800,000	\$22,850
8	50	\$1,500,000	\$30,000
9	25	\$750,000	\$30,000
10	60	\$2,500,000	\$41,700
	332	\$11,495,000	\$34,600

The cost/residence for communities 1,2,3,4,7,8,9 & 10 is less than the State's maximum of \$50,000 and all would be recommended for sound barriers. Communities 5 and 6 exceed the \$50,000 maximum. When the costs of barriers for communities 5 & 6 are averaged in with the other eight communities, the average cost/residence for the project would be \$34,600 and all ten barriers would be recommended.

## Criteria for Determining Feasibility and Reasonableness of Noise Abatement

### NOISE SENSITIVE AREA \_\_\_\_\_

<i>FEASIBILITY CRITERIA</i>	YES	NO
1. Noise Levels can be reduced by 7 dBA or more at impacted receptors		
2. Placement of a barrier will restrict pedestrian or vehicular access		
3. Construction of a barrier will cause safety or maintenance problems		
4. Noise barrier can be constructed given topography, drainage, utilities, etc.		
5. Noise barrier will have significant adverse impact on Section 4(f) resource		
6. There are non-highway noise sources the would reduce barrier effectiveness		
<i>REASONABLENESS CRITERIA</i>	YES	NO
1. Majority of impacted receptors will receive a 7 dBA or greater noise reduction		
2. 75% or more of impacted and benefited residents approve of the proposed noise abatement		
3. A 3dBA or greater change in design year build noise levels over design year no-build noise levels is expected to result from the proposed action, <i>or</i> the cumulative effects of highway improvements in the design year build noise levels at receptors that existed when prior improvements were made is equal to or greater than 3 dBA.		
3a. Noise levels equal or exceed 72 dBA at impacted receptors		
4. Noise barriers will have significant negative visual impact at impacted receptors		
5. The cost of noise abatement is equal to or less than \$50,000 per residence. impacted and benefited		
6. There is special circumstances. i.e. historical/cultural significance at this NSA.		

**Noise Abatement Criteria (NAC)**  
**Hourly A-Weighted Sound Level in Decibels (dBA)\***

<u>Activity Category</u>	<u>Leq (h)</u>	<u>L<sub>10</sub>(h)</u>	<u>Description of Activity Category</u>
A	57 (Exterior)	60 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	70 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	75 (Exterior)	Developed lands, properties or activities not included in Categories A or B above
D	--	--	Undeveloped lands.
E	52 (Interior)	55 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums

\* Either L<sub>eq</sub>(h) or L<sub>10</sub>(h) (but not both) may be used on a project.

**Note:** These sound levels are only to be used to determine impact. These are the absolute levels where abatement must be considered. Noise abatement should be designed to achieve a substantial noise reduction - not the noise abatement criteria



## 附件五：紐約市噪音管制-

NYC Chapter 2-Noise Control

## Chapter 2

### *Noise Control*

#### Subchapter

- 1 Short Title, Policy and Definitions
- 2 General Provisions
- 3 Prohibited Noise; General Prohibition
- 4 Prohibited Noise; Unreasonable Noise Standard
- 5 Prohibited Noise; Sound Level Standard
- 6 Ambient Noise Quality Zones, Criteria and Standards
- 7 Certificates and Tunneling Permits
- 8 Enforcement

#### Subchapter 1

##### *Short Title, Policy and Definitions*

- § 24-201 Short title.  
§ 24-202 Declaration of policy.  
§ 24-203 General definitions.

§ 24-201 **Short title.** This chapter shall be known and may be cited as the New York city noise control code.

§ 24-202 **Declaration of policy.** It is hereby declared to be the public policy of the city to reduce the ambient noise level in the city, so as to preserve, protect and promote the public health, safety and welfare, and the peace and quiet of the inhabitants of the city, prevent injury to human, plant and animal life and property, foster the convenience and comfort of its inhabitants, and facilitate the enjoyment of the natural attractions of the city. It is the public policy of the city that every person is entitled to ambient noise levels that are not detrimental to life, health and enjoyment of his or her property. It is hereby declared that the making, creation or maintenance of excessive and unreasonable noises within the city affects and is a menace to public health, comfort, convenience, safety, welfare and the prosperity of the people of the city. For the purpose of controlling and



reducing such noises, it is hereby declared to be the policy of the city to set the unreasonable noise standards and decibel levels contained herein and to consolidate certain of its noise control legislation into this code. The necessity for legislation by enactment of the provisions of this chapter is hereby declared as a matter of legislative determination.

This code shall be liberally construed so as to effectuate the purposes described in this section. Nothing herein shall be construed to abridge the emergency powers of the board of health or the right of the department of health to engage in any of its necessary or proper activities. Nothing herein shall abridge the powers and responsibilities of the police department to enforce the provisions of this code.

§ 24-203 **General definitions.** When used in the New York city noise control code:

(a) "A" level means the total sound level of all noise as measured with a sound level meter using the "A" weighting network. The unit of measurement is the db(A).

(b) Activity means any act or combination of acts which actually results in the production of sound.

(c) Air compressor means a device which draws in air or gas, compresses it, and delivers it at a higher pressure.

(d) Aircraft means any device that is used or intended to be used for flight in the air but does not include any such device used only in the service of a government or political subdivision thereof unless such device is engaged in carrying persons or property for commercial purposes. Aircraft includes but is not limited to:

1. subsonic transport aircraft;
2. subsonic turbojet-powered aircraft;
3. aircraft capable of flying at supersonic speeds;
4. rotocraft;
5. vertical take-off and landing aircraft (VTOL aircraft);
6. short take-off and landing aircraft (STOL aircraft); and
7. aircraft capable of landing or taking off on water.

(e) Air horn means a device intended to produce a sound signal by means of compressed air or gas or exhaust gas.

(f) Airport means an area of land or water that is used or intended to be used for the landing and take off of aircraft, and includes its buildings and facilities, if any.

(g) Ambient noise means the all-encompassing noise associated with a given environment, being usually a composite of sounds from many sources near and far.

(h) Apparatus means any mechanism which prevents, controls, detects, measures or records the production of sound.

(i) Authorized emergency vehicle means every ambulance and every vehicle operated by a police department, fire department, fire patrol, chief or assistant chief of a fire department, county or deputy county fire coordinator, county or assistant county fire marshal, sheriff, or by a chief, assistant chief or deputy chief of a police department, a regular paid deputy sheriff or a motor vehicle of the New York city housing authority when engaged in the performance of duty as a peace officer, or by an authorized public utility company when on emergency calls, every state-owned vehicle operated by a law enforcement officer of the conservation department when engaged in performance of duty in enforcement of the environmental conservation law, and every vehicle operated by a bridge authority or bridge and tunnel authority when on emergency calls.

(j) Board means the environmental control board of the city of New York.

(k) Building means a building as defined in article two of subchapter two of chapter one of title twenty-seven of the code.

(l) Building aperture means any designed opening in a building to which a person may reasonably have access including but not limited to any door, gate, window, skylight or hatch.

(m) Burglar alarm means any sound signal device designed and intended to produce a sound signal upon unauthorized entrance by a person into a building or motor vehicle.

(n) "C" level means the total sound level of all noise as measure with a sound level meter using the "C" weighting network. The unit of measurement is the db(C).

(o) Certificate means an operating or temporary operating certificate.

(p) Charter means the charter of the city of New York including all of its amendments.

(q) Circulation device means any device which circulates a gas or fluid, including but not limited to any air conditioner, pump, cooling tower, fan or blower.

(r) Claxon means any manually, mechanically, or electrically powered device, other than an emergency signal device, including but not limited to a motor vehicle horn, which is intended to, and when operated actually does, emit a sound signal.

(s) This code means the New York city noise control code.

- (t) Commissioner means commissioner of environmental protection.
- (u) Construction means any or all activity, except tunneling, necessary or incidental to the erection, demolition, assembling, altering, installing or equipping of buildings, public or private highways, roads, premises, parks, utility lines including such lines in already-constructed tunnels, or other property, including land clearing, grading, excavating and filling.
- (v) Construction device means any device designed and intended for use in construction including, but not limited to any air compressor, pile driver, manual tool, bulldozer, pneumatic hammer, steam shovel, derrick, crane, steam or electric hoist.
- (w) Construction material means any material, regardless of composition, designed and customarily used in construction including but not limited to any rails, pillars, columns, beams, bricks, flooring, wall, ceiling or roofing material, gravel, sand, cement or asphalt.
- (x) Container means any receptacle, regardless of contents, manufactured from wood, metal, plastic, paper or any other material including but not limited to any barrel, basket, box, crate, tub, bottle, can or refuse container.
- (y) Decibel. The decibel is one-tenth of a bel. Thus, the decibel is a unit of level when the base of the logarithm is the tenth root of ten, and the quantities concerned are proportional to power.
- (z) Device means any mechanism which is intended to or which actually produces sound when operated or handled.
- (aa) Department means the department of environmental protection.
- (bb) Dwelling means any building occupied in whole or in part as the temporary or permanent residence of one or more natural persons.
- (cc) Dynamic insertion loss means the difference between two sound pressure levels which are measured at the same point in space before and after a muffler is inserted between the measurement point and the sound source under operating conditions.
- (dd) Emergency means a public calamity or an exposure of any person or property to imminent danger.
- (ee) Emergency signal device means any gong, siren whistle, or siren or any air horn or any similar device the use of which on authorized emergency vehicles is permitted by subdivision twenty-six of section three hundred seventy-five of the vehicle and traffic law.
- (ff) Exhaust source means a system which removes and transports air or gas from a device.
- (gg) Internal combustion engine means a device for the production of energy by means of the combustion under pressure of fossil fuel.

(hh) Lawn care device means any device powered mechanically, by electricity, by gasoline, by diesel fuel or by any other fuel, which is intended to be used or is actually used for the mowing of grass, the cutting or chipping of trees, tree roots or tree branches, or the clearing of leaves or other vegetation from lawns, sidewalks, public streets or public highways and shall include, but not be limited to, such devices as lawn mowers and lawn mower attachments, lawn edgers, leaf blowers, leaf vacuums, mulchers and chippers.

(ii) Motor vehicle means any device which is propelled by an engine in or upon which a person or material may be transported on the ground and which is intended to be operated upon a public highway.

(jj) Muffler means an apparatus generally consisting of but not limited to a series of chambers or baffles for the purpose of transmitting gases while reducing sound levels.

(kk) Noise means an erratic, intermittent, or statistically random oscillation.

(ll) Owner means and includes the owner of the freehold of the premises or lesser estate therein, or mortgagee thereof, a lessee or agent of any of the above persons, a lessee of a device or his or her agent, a tenant, operator, or any other person who has regular control of a device or an apparatus.

(mm) Paving breaker means any powered construction device intended to cut or trench pavement, subbase macadam, gravel, concrete or hard ground.

(nn) Person means any individual, partnership, company, corporation, association, firm, organization, governmental agency, administration or department, or any other group of individuals, or any officer or employee thereof.

(oo) Power tool means any device powered mechanically, by electricity, by gasoline, by diesel fuel or by any other fuel, which is intended to be used or is actually used for, but shall not be limited to, the performance of such functions as cutting, nailing, stapling, sawing, vacuuming or drilling.

(pp) Railroad means a railroad, other than a rapid transit railroad or street railroad, operated for public use in the conveyance of persons or property for compensation, with all bridges, ferries, tunnels, equipment, switches, spurs, tracks, stations and terminal facilities used, operated or owned by or in connection therewith.

(qq) Rapid transit railroad means a rapid transit railroad used for local service in the transportation of passengers as a common carrier for hire together with the appurtenances, facilities and equipment thereof.

(rr) Refuse compacting vehicle means a motor vehicle designed to compact and transport refuse.

(ss) Sound means an oscillation in pressure, stress, particle displacement, particle velocity, etc., in a medium with internal forces (e.g., elastic, viscous), or the superposition of such propagated oscillation which evokes an auditory sensation.

(tt) Sound level meter means any instrument including a microphone, an amplifier, an output meter, and frequency weighting networks for the measurement of noise and sound levels in a specified manner and which complies with standards established by the American National Standards Institute specifications for sound level meters S1.4-1971, as amended.

(uu) Sound pressure level (decibels) means a sound that is twenty times the logarithm to the base ten of the ration of the pressure of the sound to the reference pressure,  $2 \times 10^{-4}$  microbars.

(vv) Sound reproduction device means a device intended primarily for the production or reproduction of sound, including but not limited to any musical instrument, radio receiver, television receiver, tape recorder, phonograph or sound amplifying system.

(ww) Sound signal means any sound produced by a sound signal device designed to transmit information.

(xx) Sound signal device means a device designed to produce a sound signal when operated, including but not limited to any claxon, air horn, whistle, bell, gong, siren, but not an emergency signal device.

(yy) Sound source means any activity or device as herein defined.

(zz) This code means the noise control code.

(aaa) Tunnel means an underground passage which is intended for use as a railway, aqueduct, road, sewer or major utility artery.

(bbb) Tunneling means any activity necessary or incidental to the construction of any tunnel, including the sinking of shafts to tunnel or to an intermediate level and the surface activities required to sink the shafts and construct the tunnel.

(ccc) Unreasonable noise means any excessive or unusually loud sound that disturbs the peace, comfort or repose of a reasonable person of normal sensitivities, injures or endangers the health or safety of a reasonable person of normal sensitivities or which causes injury to plant or animal life, or damage to property or business.

(ddd) Zone means any zone as defined in the zoning resolution of the city of New York, except that zone shall not mean any ambient noise quality zone under subchapter five or subchapter six of this chapter of this code or any noise sensitive zone under subchapter four of this chapter of this code.

(eee) Audible status indicator means any sound reproduction device on a motor vehicle that emits or causes to be emitted any continuous or near continuous sound for the purpose of warning that an audible burglar alarm has been installed on such motor vehicle and is operational or for creating the appearance that such an alarm has been installed on such motor vehicle and is operational.

## Subchapter 2

### *General Provisions*

§ 24-204	General powers of the commissioner.
§ 24-205	Investigations and studies by the commissioner.
§ 24-206	Testing by order of the commissioner.
§ 24-207	Inspection.
§ 24-208	Registrations.
§ 24-209	Interfering with or obstructing department personnel.
§ 24-210	False and misleading statements; unlawful reproduction or alteration of documents.
§ 24-211	Display of permits, certificates and other notices; removal or mutilation prohibited.
§ 24-212	Enforcement of code by other than compulsory means.
§ 24-213	Service of papers.
§ 24-214	Inconsistent provisions.
§ 24-215	[Reserved]
§ 24-216	Noise abatement contract compliance.
§ 24-217	Exemptions.

**§ 24-204 General powers of the commissioner.** Subject to the provisions of this code, the commissioner may take such action as may be necessary to abate a sound source which causes or may cause, by itself or in combination with any other sound source or sources, an unreasonable noise. The commissioner may exercise or delegate any of the functions, powers and duties vested in him or her or in the department by this code.

**§ 24-205 Investigations and studies by the commissioner.** The commissioner may make or cause to be made any investigation or study which in his or her opinion is desirable for the purpose of enforcing this code or controlling or abating an unreasonable noise. For such purposes, the commissioner may make tests, conduct hearings, compel the attendance of witnesses, and take their testimony under oath and may compel the production of books, papers and other things reasonably necessary to the matter under consideration.

**§ 24-206 Testing by order of the commissioner.** (a) If the commissioner has reasonable cause to believe that any device is in violation of this code, the commissioner may order the owner of the device to conduct such tests as are necessary in the opinion of the commissioner to determine whether the device or its operation is in violation of this code and to submit the test results to the commissioner within ten days after the tests are completed.

(b) Such tests shall be conducted in a manner approved by the commissioner. If any part of the test is conducted at a place other than the site where the device is located, that part of the test shall be certified by a laboratory acceptable to the commissioner. The commissioner may require that the entire test results shall be reviewed and certified by a professional engineer.

(c) The owner shall notify the commissioner of the time and place of a test at least seven days before the commencement of such test. Reasonable facilities shall be made available for the commissioner to witness the test.

(d) If in the opinion of the commissioner, tests by the department are necessary, the commissioner may order the owner to provide such access to the device as the commissioner may reasonably request, to provide a power source suitable to the points of testing, and to provide allied facilities, exclusive of sound level meter. These provisions shall be made at the expense of the owner of the device. The owner shall be furnished with copies of the analytical results of the data collected.

**§ 24-207 Inspection.** (a) The department may inspect at any reasonable time and in a reasonable manner any device which creates or may create unreasonable noise including but not limited to the premises where the device is used.

(b) The department may inspect at any reasonable time in a reasonable manner any record relating to a use of a device which creates or may create unreasonable noise.

(c) No person shall refuse entry or access into the public areas of a multiple dwelling or a place of business to an authorized employee of the department who presents appropriate credentials nor shall any person refuse entry or access into any other portion of a premise to an authorized employee of the department who presents appropriate credentials and a search warrant.

**§ 24-208 Registrations.** (a) The commissioner may require the written registration of air compressors, paving breakers, refuse compacting vehicles and rapid transit railroads, including but not limited to its rolling stock, track and trackbeds, passenger stations, tunnels, elevated structures, yards, depots and garages. A period of sixty days shall be allowed for the filing of such registration. However, in cases of emergency, the commissioner may designate a shorter period of time.

(b) Registration shall be made on forms furnished by the department. The forms may require information concerning the device covered by the registration, the sound level caused by the device or any additional information required by the commissioner for the purpose of enforcing this code. The registrant shall maintain the registration in current status by notifying the

Department of any change in any item of information furnished in compliance with this subdivision within a reasonable time not exceeding thirty days after the change is made.

(c) Registration shall be made by the owner of the device. If a registrant is a partnership or group other than a corporation, the registration shall be made by one individual who is a member of the group. If the registrant is a corporation, the registration shall be made by an officer of the corporation.

**§ 24-209 Interfering with or obstructing department personnel.** No person shall interfere with or obstruct the commissioner or any department employee in carrying out any duty for the commissioner or the board.

**§ 24-210 False and misleading statements; unlawful reproduction or alteration of documents.** (a) No person shall knowingly make a false or misleading statement or submit a false or misleading document to the department as to any matter within the jurisdiction of the department.

(b) No person shall make, reproduce or alter or cause to be made, reproduced or altered a tunneling permit, certificate or other document issued by the commissioner or required by this code if the purpose of such reproduction or alteration is to evade or violate any provision of this code or any other law.

**§ 24-211 Display of permits, certificates and other notices; removal or mutilation prohibited.** Any tunneling permit or certificate required by this code shall be displayed in the vicinity of the device on the premises designated on the tunneling permit or certificate or in the vicinity of the place where the device will be operated or supervised.

**§ 24-212 Enforcement of code by other than compulsory means.** Nothing in this code shall prevent the commissioner from making efforts to obtain voluntary compliance by way of warning, notice or educational means. However, such noncompulsory methods need not be used before proceeding by way of compulsory enforcement.

**§ 24-213 Service of papers.** (a) Service of any written notice, order or decision required by this code shall be made on the owner as follows:

(1) Either by mailing the notice, order or decision directed to the owner of the device at the address listed in his or her application, tunneling permit or operating certificate or at the address where the device is located; or

(2) By leaving the notice, order or decision with the owner of the device, or if the owner is not an individual, with a member of the partnership or group concerned or with an officer or managing agent of the corporation.



(b) Service of any written notice, order or decision required by this code shall be made on a person:

(1) Either by mailing the notice, order or decision directed to the person at his or her principal place of business; or

(2) By leaving the notice, order or decision with the person, or if the person is not an individual, with a member of the partnership or group concerned, or with an officer or managing agent of the corporation.

(c) Service of any written notice required by this code shall be made on the department, commissioner or board as follows:

(1) Either by mailing the notice to the commissioner; or

(2) By leaving the notice at the department or with an employee of the department designated for this purpose.

**§ 24-214 Inconsistent provisions.** Insofar as the provisions of this code are inconsistent with any provision of any other title of the code, or any rule or regulation of any governmental agency of the city of New York, the provisions of this code shall be controlling.

§ 24-215 [*Reserved*]

**§ 24-216 Noise abatement contract compliance.** (a) (1) Contract. As used in this section, the term “contract” means any written agreement, purchase order or instrument whereby the city is committed to expend or does expend funds authorized by the capital budget of the city of New York in return for work, labor, services, supplies, equipment, materials, or any combination of the foregoing; however, the term “contract” shall not include:

(i) contracts for financial or other assistance made with a government;

(ii) contracts, resolutions, indentures, declarations of trust, or other instruments authorizing or relating to the authorization, issuance, award and sale of bonds, certificates of indebtedness, notes or other fiscal obligations of the city, or consisting thereof;

(iii) employment by the city of officers and employees of the city.

(2) Contracting agency. As used in this section, the term “contracting agency” means any board, bureau, department, commission or other agency of the government of the city of New York, or any official thereof, who or which is authorized to and does, on behalf of the city, provide for, enter into, award or administer contracts or any other public agency which enters into, awards or administers contracts pursuant to which funds authorized by the capital budget of the city of New York are expended.

(b) **Contract provisions.** No contract shall be awarded or entered into by a contracting agency, unless such contract contains provisions requiring that:

1. Devices and activities which will be operated, conducted, constructed or manufactured pursuant to the contract and which are subject to the provisions of the code will be operated, conducted, constructed or manufactured without causing a violation of the code; and

2. Such devices and activities incorporate advances in the art of noise control developed for the kind and level of noise emitted or produced by such devices and activities.

(c) **Regulations.** The commissioner may from time to time promulgate regulations setting forth such specifications for the operation, conducting, construction or manufacture of devices and activities pursuant to city contracts as he or she deems necessary to comply with the provisions of this section.

(d) No person shall cause or permit the operation of a device or conducting of an activity in such a way as to violate any provision of a contract required by this section or any regulation promulgated pursuant to this section.

(e) No regulations promulgated pursuant to this section shall alter the terms, conditions and specifications of a contract for which bids have been opened, at the time of issuance of such regulation.

**§ 24-217 Exemptions.** The provisions of this code shall not apply to the operation or use of any organ, bell, chimes or other similar instrument by any church, synagogue, mosque or school.

**Subchapter 3**

*Prohibited Noise;*  
*General Prohibition*

**§ 24-218 General prohibitions.**

**§ 24-218 General prohibitions.** No person shall make, continue or cause or permit to be made or continued any unreasonable noise, except that this section shall not apply to any sound from any source where the decibel level of such sound is within the limits prescribed by another section of this title and where there is compliance with all other applicable requirements of law with respect to such sound.

## Subchapter 4

### *Prohibited Noise*

#### *Unreasonable Noise Standard*

§ 24-219	[Reserved]
§ 24-220	Sound reproduction devices.
§ 24-221	Sound signal devices.
§ 24-222	Animals.
§ 24-223	Emergency signal devices.
§ 24-224	Construction activities.
§ 24-225	Construction devices.
§ 24-226	Containers and construction material.
§ 24-227	Exhausts.
§ 24-227.1	Lawn care devices.
§ 24-227.2	Power tools.
§ 24-228	Schools, hospitals, courts.
§ 24-229	Noise sensitive zones.
§ 24-230	Regulations.

#### § 24-219 [Reserved]

§ 24-220 **Sound reproduction devices.** (a) Except as provided in section 10-108 of the code, no person shall operate or use or cause to be operated or used any sound reproduction device in such a manner as to create any unreasonable noise.

(b) No person shall operate or use or cause to be operated or used any sound reproduction device for commercial or business advertising purposes or for the purpose of attracting attention to any performance, show, or sale or display of merchandise, in connection with any commercial or business enterprise including those engaged in the sale of radios, television sets, phonographs, tape recorders, phonograph records or tapes, in front or outside of any building, place or premises, or in or through any aperture of such building, place or premises, abutting on or adjacent to a public street, park or place, or in or upon any vehicle operated, standing or being in or on any public street, park or place, where the sound therefrom may be heard upon any public street, park or place, or from any stand, platform or other structure, or from any airplane or other device used for flying, flying over the city, or on a boat or on the waters within the jurisdiction of the city, or anywhere on the public streets, parks or places. Nothing in this section is intended to prohibit incidental sounds emanating from a sporting or entertainment or a public event for which a permit under section 10-108 of the code has been issued.

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(c) No person shall operate or use any radio, phonograph, or tape recorder in or on any rapid transit railroad, omnibus or ferry in such a manner that the sound emanating from such sound reproduction device is audible to another person.

**§ 24-221 Sound signal devices.** No person shall operate or use or cause to be operated or used any sound signal device so as to create an unreasonable noise, except that:

(a) No person shall operate or use or cause to be operated or used any claxon installed on a motor vehicle, except as a sound signal of imminent danger, provided that such operation or use shall be considered in any proceeding before the board pursuant to any applicable section of subchapter eight of this chapter of this code, except section 24-269 prima facie evidence of a violation of this subdivision, and that a notice of violation shall in every instance issue against a person operating, using or causing to be operated or used a claxon installed on a motor vehicle.

(b) No person shall operate or use or cause to be operated or used an air horn installed on any motor vehicle other than as provided in section 24-223 of this code.

(c) No person shall operate or use or cause to be operated or used any steam whistle attached to any stationary boiler, except to give notice of the time to start and stop work or as a sound signal of imminent danger.

(d) No owner of a building or of a motor vehicle shall have in operation an audible burglar alarm thereon unless such burglar alarm shall be capable of and shall automatically terminate its audible response within fifteen minutes of its being activated in the case of a building, and three minutes of its being activated in the case of a motor vehicle. No audible burglar alarm on a motor vehicle shall be capable of being activated except by (i) direct physical contact with that motor vehicle or (ii) through the use of an individual remote activation device that is designed to be used with the audible burglar alarm system of a particular vehicle which alarm shall be capable of and shall terminate its audible response within three minutes of its being activated.

(e) No owner of a motor vehicle shall have in operation an audible status indicator on such motor vehicle.

(f) Notwithstanding the provisions of subdivision (d) of this section, any member of the police department of the city of New York shall have the right to take such steps as may be reasonable and necessary to disconnect any audible burglar alarm or audible status indicator which is installed on a motor vehicle at any time during the period of its activation.

(g) The operator of any motor vehicle on which an audible burglar alarm has been installed shall, when parked on a public highway or parking lot open to the public, prominently display the number and telephone number of the owner's local police precinct where information shall be on file to permit communication with the owner of such motor vehicle.

(h) (1) Notwithstanding the provisions of subdivision (d) of this section, any member of the police department may arrange for the removal of a motor vehicle from a public highway or parking lot open to the public, when (i) an audible burglar alarm installed on such vehicle is operated in violation of this section or an audible status indicator is operated on such vehicle and (ii) all reasonable and necessary steps to disconnect such alarm or audible status indicator have been taken without success. Authorized personnel of the department or the department of transportation may request a member of the police department to arrange for the removal of such vehicle. When such removal is requested, the notice of violation for operation of an audible burglar alarm in violation of this section or for the operation of an audible status indicator shall state that a member of the police department took all reasonable and necessary steps to disconnect such alarm or such audible status indicator without success. Such removal may be accomplished by utilizing any existing city-operated tow program, the rotation tow program established pursuant to section 20-519 of the code or such other procedures as may be established. The cost of towing and storage of such motor vehicle shall be the responsibility of the owner or other person who claims such motor vehicle.

(2) An opportunity for a hearing before the environmental control board shall be provided to the owner of a motor vehicle removed pursuant to paragraph one of this subdivision within five business days after a request for a hearing is made to determine whether there was a basis for such removal. The environmental control board shall render a decision within two business days following the conclusion of the hearing. If it is determined that there was no basis for removal of a vehicle pursuant to paragraph one of this subdivision, the owner of such vehicle may recover from the city any amounts paid by such owner for towing and storage.

(i) The department, the police department and the department of transportation shall have the authority to enforce the provisions of this section.

(j) No person shall operate or use or cause to be operated or used any sound signal device attached to a motor vehicle, wagon or manually propelled cart from which food or any other items are sold, which emits a sound signal more frequently than once every ten minutes in any one city block and with a duration of more than ten seconds for any single emission.

**§ 24-222 Animals.** No person shall permit an animal, including a bird, under his or her control to cause unreasonable noise.

**§ 24-223 Emergency signal devices.** No person shall operate or use or cause to be operated or used any emergency signal device, except on an authorized emergency vehicle when such vehicle is in the immediate act of responding to an emergency; provided that such device shall not be operated so as to create an unreasonable noise nor for a period of time longer than is strictly necessary to respond to such emergency.

**§ 24-224 Construction activities.** (a) Except as otherwise provided in this section, no person shall engage in or permit any person to be engaged in construction activities in any zone other than on weekdays between the hours of seven a.m. and six p.m. A person may, however, engage in construction ac-

tivities on one or two family dwellings, convents or rectories, which are classified in occupancy group J-3 as defined by section 27-266 of the administrative code, on Saturdays and Sundays between the hours of ten a.m. and four p.m. Such activities, however, must be located a distance of three hundred or more feet from a house of worship.

(b) Subject to the provisions of section 24-257 of this code, an agency of the city of New York authorized under the code to issue permits or licenses authorizing construction activities may, in the case of urgent necessity in the interest of public safety, issue a variance from the provisions of subdivision (a) of this section with respect to any such construction activity. Such variance may be granted for an initial period of up to three days, and may be renewed for periods of three days or less while such urgent necessity continues. Any such agency shall be authorized to promulgate regulations imposing an application fee in an amount not to exceed one hundred fifty dollars for each initial application for such variance and a fee not to exceed one hundred fifty dollars for each application for a renewal thereof. Any such agency shall also be authorized to impose a fee in an amount not to exceed one hundred dollars for each day for which such variance is granted or renewed. Such variance shall be clearly marked on such license or permit and shall be prominently posted at the site of such construction activities by the permittee or licensee. A copy of such marked license or permit shall be promptly forwarded to the board. In the case of an emergency, construction activities directly connected with the abatement of such emergency may be undertaken without a variance as herein provided for a period of not to exceed twelve hours from the commencement of such construction, during which time application for a variance hereunder shall be made.

**§ 24-225 Construction devices.** Except as provided in subchapter five of this chapter of this code, no person shall operate or use or cause to be operated or used a construction device in such a way as to create an unreasonable noise.

**§ 24-226 Containers and construction material.** No person shall handle or transport or cause to be handled or transported in any public place, any container or any construction material in such a way as to create an unreasonable noise.

**§ 24-227 Exhausts.** Except as otherwise provided in this code, no person shall cause or permit discharge into the open air of the exhaust of any device, including but not limited to any steam engine, diesel engine, internal combustion engine or turbine engine, so as to create an unreasonable noise.

**§ 24-227.1 Lawn care devices.** a. No person shall operate or use or cause to be operated or used any lawn care device: (i) before eight a.m. and after seven p.m. or sunset, whichever occurs later; or (ii) at any time in such a way as to create an unreasonable noise.

b. The provisions contained in paragraph (i) of subdivision a of this section shall not apply to an employee of the department of parks and recreation who operates or uses or causes to be operated or used any lawn care device between

the hours of seven a.m. and eight a.m. in any location more than three hundred feet from any building that is lawfully occupied for residential use. The distance of three hundred feet shall be measured in a straight line from the point on the exterior wall of such building nearest to any point in the location at which such lawn care device is operated or used or caused to be operated or used.

**§ 24-227.2 Power tools.** No person shall operate or use or cause to be operated or used any power tool in such a way as to create an unreasonable noise; provided, however, that when a person actually operates or uses a snow blower, or causes a snow blower to be operated or used, for the purpose of complying with subdivision a of section 16-123 of this code, such person shall not be in violation of this section.

**§ 24-228 Schools, hospitals, courts.** No person shall cause or permit the creation of any unreasonable noise through the use of any device on any street adjacent to any school or court while the same is in session, or adjacent to any hospital.

**§ 24-229 Noise sensitive zones.** (a) Whenever the protection of the public health and comfort so requires, the commissioner and the board of health may by joint order designate any geographical area of the city of New York as a noise sensitive zone. Such designation shall be accompanied by a joint administrative order setting forth a description of the subject geographical area, the reasons for its determination as a noise sensitive zone, and shall list those activities which if undertaken in such zone, would constitute unreasonable noise. Such order shall be published in the City Record at least five days but not more than ten days prior to its effective date, and shall be effective for a period of not more than sixty days, renewable for additional periods of sixty days.

(b) Any person suffering undue hardship by reason of the operation of an order promulgated pursuant to subdivision (a) hereof may request a hearing on written notice to the commissioner. Such person shall be afforded a hearing within ten days of receipt of such notice. The commissioner shall issue a final decision thereon within three days of the conclusion of a hearing held pursuant to this subdivision.

(c) No person shall engage in or permit any person to be engaged in any activity so as to violate the provisions of any order issued pursuant to subdivision (a) hereof.

**§ 24-230 Regulations.** The commissioner shall have the power to promulgate such regulations as may be necessary to carry out the purposes of this chapter.





**Subchapter 5**

*Prohibited Noise;  
Sound Level Standard*

§ 24-231	[Reserved]
§ 24-232	Motor vehicles.
§ 24-233	Aircraft.
§ 24-234	Rapid transit railroads.
§ 24-235	Railroads.
§ 24-236	Air compressors.
§ 24-237	Circulation devices.
§ 24-238	Refuse compacting vehicles.
§ 24-239	Motor vehicle claxons.
§ 24-240	Emergency signal devices.
§ 24-241	Paving breakers.
§ 24-241.1	Commercial music.
§ 24-242	Regulations.

**§ 24-231 [Reserved]**

**§ 24-232 Motor vehicles.** (a) No person shall operate or permit to be operated any motor vehicle at any time or under any condition whatsoever, including but not limited to grade, load, idling, velocity, acceleration or deceleration, in such manner as to exceed the sound levels set out in either column I or column II of table I below, measured as follows: the sound levels listed in column I shall be measured by a sound level meter placed at a distance of fifty feet plus or minus two feet from the center of the lane of the public highway in which the motor vehicle is idling or is traveling within the speed limits specified in this section; the sound levels listed in column II shall be measured by a sound level meter placed at a distance of twenty-five feet plus or minus two feet from the center of the lane of the public highway in which the motor vehicle is idling or is traveling within the speed limits specified in this section.

(b) Where a motor vehicle is operated in a place other than a public highway, the sound levels in column I shall be measured by a sound level meter placed at a distance of fifty feet plus or minus two feet from the center line of the rear face of such vehicle where such vehicle is idling or is traveling within the speed limits specified in this section; the sound levels

listed in column II shall be measured by a sound level meter placed at a distance of twenty-five feet plus or minus two feet from the center line of the rear face of such vehicle when such vehicle is idling or is traveling within the speed limits specified in this section.

**TABLE I**

	Speed limit of 35 mph or less	Speed limit of more than 35 mph
<b>Column I</b>		
(1) Any motor vehicle with a manufacturer's gross vehicle rating of eight thousand pounds or more and any combination of vehicles towed by such motor vehicle . . . . .	86 db(A)	90 db(A)
(2) Any motorcycle other than a motor driven cycle before January 1, 1978 . . . . .	82 db(A)	86 db(A)
after January 1, 1978 . . . . .	78 db(A)	82 db(A)
(3) Any other motor vehicle and any combination of vehicles towed by such motorvehicle before January 1, 1978 . . . . .	76 db(A)	82 db(A)
after January 1, 1978 . . . . .	70 db(A)	79 db(A)
	Speed limit of 35 mph or less	Speed limit of more than 35 mph
<b>Column II</b>		
(1) Any motor vehicle with a manufacturer's gross vehicle rating of eight thousand pounds or more and any combination of vehicles towed by such motor vehicle . . . . .	92 db(A)	96 db(A)
(2) Any motorcycle other than a motor driven cycle before January 1, 1978 . . . . .	88 db(A)	92 db(A)
after January 1, 1978 . . . . .	84 db(A)	88 db(A)
(3) Any other motor vehicle and any combination of vehicles towed by such motorvehicle before January 1, 1978 . . . . .	82 db(A)	88 db(A)
after January 1, 1978 . . . . .	76 db(A)	85 db(A)

§ 24-233 Aircraft. On or before September first, nineteen hundred seventy-three, the commissioner shall define and submit to the city council for

enactment into this code allowable sound levels and ambient noise quality criteria and standards for areas affected by noise generated by airports and aircraft using airports in the city of New York. Such sound levels and such ambient noise quality criteria and standards shall be developed in accordance with a comprehensive methodology for controlling and abating airport noise, including but not limited to the following methods:

1. Encouraging use of the airport by aircraft classes with lower sound level characteristics and discouraging use by higher sound level aircraft classes;
2. Encouraging approach and departure flight paths and procedures to minimize the noise in residential areas;
3. Planning runway utilization schedules to take into account adjacent residential areas, noise characteristics of aircraft and noise sensitive time period;
4. Reduction of the flight frequency, particularly in the most noise sensitive time periods and by the noisier aircraft;
5. Employing shielding for advantage, using natural terrain, buildings, etc.; and
6. Development of a compatible land use within the noise impact boundary.

Preference shall be given to actions which reduce the impact of airport noise on existing communities. Land use conversion involving existing residential communities shall be considered the least desirable action for achieving compliance with allowable sound levels and ambient noise quality criteria and standards adopted pursuant to this section.

Allowable sound levels and ambient noise quality criteria and standards defined and submitted pursuant to this section shall accurately reflect the latest scientific knowledge useful in indicating the kind and extent of all identifiable effects on public health, welfare and comfort of any noise, or combination of noises, generated by airports and aircraft using airports in the city of New York and shall be based on the latest economically feasible and available technology for the abatement of noise generated by airports in the city of New York.

**§ 24-234 Rapid transit railroads.** (a) On or before September first, nineteen hundred seventy-three, the commissioner shall define and submit to the city council for enactment into this code allowable sound levels and acoustical performance standards for the design and operation of new and existing rapid transit railroads, including but not limited to allowable sound levels and acoustical performance standards for rolling stock, track and track beds, passenger stations, tunnels, elevated structures, yards, depots and garages.

Allowable sound levels and acoustical performance standards shall be based on the latest economically feasible and available technology for noise abatement in rapid transit railroads and on the latest scientific knowledge useful for indicating the kind and extent of all effects on public health, welfare, safety and comfort which can be expected from noises or combinations of noises generated by rapid transit railroads.

(b) No person shall operate or permit to be operated a rapid transit railroad, including but not limited its rolling stock, track and track beds, passenger stations, tunnels, elevated structures, yards, depots and garages so as to cause a violation of allowable sound levels or acoustical performance standards adopted by the city council pursuant to this section.

**§ 24-235 Railroads.** (a) On or before September first, nineteen hundred seventy-three, the commissioner shall define and submit to the city council for enactment into this code allowable sound levels and acoustical performance standards for the operation of new and existing railroads, including allowable sound levels and acoustical performance standards for rolling stock, bridges, ferries, tunnels, equipment, switches, spurs, tracks, stations, yards and terminal facilities.

Allowable sound levels and acoustical performance standards except as otherwise provided in this section, shall be based on the latest economically feasible and available technology for noise abatement in railroads and on the latest scientific knowledge useful for indicating the kind and extent of all effects on public health, welfare, safety and comfort which can be expected from noises or combinations of noises generated by railroads.

(b) No person shall operate or permit to be operated a railroad, including but not limited to rolling stock, bridges, ferries, tunnels, equipment, switches, spurs, tracks, stations, yards and terminal facilities, so as to cause a violation of allowable sound levels or acoustical performance standards adopted by the city council pursuant to this section.

**§ 24-236 Air compressors.** (a) On or after September thirty-first, nineteen hundred seventy-two, no person shall operate or cause to be operated an air compressor manufactured prior to December thirty-first, nineteen hundred seventy-two, unless a muffler certified by the manufacturer of such muffler to provide a dynamic insertion loss of 20 db(C) of the sound release from the exhaust source of such air compressor is installed on such exhaust source.

(b) No person shall, after the effective dates set out in table II, operate or permit to be operated an air compressor manufactured prior to December thirty-first, nineteen hundred seventy-two in such a manner as to cause the maximum sound level of such air compressor, when measured at a distance of one meter from the nearest major surface of such air compressor, to exceed the applicable allowable sound level set out therein.

TABLE II

<u>Effective date</u>	<u>Allowable sound level</u>
December 31, 1972	90 db(A)
June 30, 1974	85 db(A)

(c) No person shall sell, offer for sale for use within the city of New York, or operate or permit to be operated an air compressor manufactured on or after the effective dates set out in Table III which when operated produces a maximum sound level, when measured at a distance of one meter from the nearest major surface of such air compressor, exceeding the applicable allowable sound level set out therein.

TABLE III

<u>Effective date</u>	<u>Allowable sound level</u>
December 31, 1972	85 dB(A)
June 30, 1974	80 dB(A) for sizes 350 cfm or less 85dB(A) for sizes greater than 350 cfm
December 31, 1981	75 dB(A) for sizes 350 cfm or less 80 dB(A) for sizes greater than 350 cfm

(d) Except for work actually being done on a sidewalk or crosswalk, no person shall operate or permit to be operated an air compressor so as to generate noise levels in excess of 75dB(A) at nearby sidewalks, pedestrian crossings or dwellings, on and after January first, nineteen hundred seventy-nine but this limitation shall not apply where more than one lane of traffic would be necessary to implement same.

**§ 24-237 Circulation devices.** No person shall operate or permit to be operated a circulation device in such a manner as to create a sound level in excess of 45 dB(A) when measured inside the dwelling unit affected in a line with the window nearest the exterior face of such circulation device. The measurement shall be taken with the window fully open at a point three feet from the open portion of the window.

**§ 24-238 Refuse compacting vehicles.** (a) No person shall sell, offer for sale, operate or permit to be operated a refuse compacting vehicle manufactured after the effective dates set out in table IIIA, which when compacting produces a maximum sound level, when measured by a sound level meter set for slow response at a distance of ten feet from the center line of the face of the compacting unit, exceeding the applicable sound level set out therein.

**TABLE IIIA**

<b>Effective date</b>	<b>Allowable sound level</b>
December 31, 1974	75 dB(A)
December 31, 1978	70 dB(A)

(b) The commissioner may grant to any person a variance for the sale, purchase and operation of refuse compacting vehicles which when compacting produce a sound level exceeding the limitations set forth in this section whenever it is found, upon presentation of adequate proof, that compliance therewith would impose an unreasonable hardship. In the granting of such variance, the commissioner may impose such conditions as the policies of this code may require.

(c) A variance granted pursuant to subdivision (b) of this section shall be valid for the initial purchase of the refuse compacting equipment which is the subject of the variance request and shall be valid for the operation of such equipment by the original purchaser for a period not to exceed the useful life of the equipment covered by such variance. If, in the opinion of the commissioner, application of a reasonable retrofit program will permit refuse compacting vehicles purchased under a variance granted pursuant to subdivision (b) of this section to achieve substantial compliance with the noise standards of this code, the commissioner may require the owner of equipment operating under such a variance to initiate such a retrofit program in order to obtain such substantial compliance.

(d) Any person seeking a variance shall do so by filing a petition in a form acceptable to the commissioner. The commissioner shall promptly give written notice of such petition to any person in the city of New York who has in writing requested notice of such variance petitions, and shall promptly publish notice of such petition in the City Record. If the commissioner, in his or her discretion, concludes that a hearing would be advisable, or if any person files a written objection to the granting of such variance within twenty-one days from the publication of notice in the City Record, then a public hearing shall be held unless the variance is revised to meet such objection.

(e) The power of the commissioner to grant a variance pursuant to this section shall terminate September first, nineteen hundred seventy-three.

**§ 24-239 Motor vehicle claxons.** No person shall sell, offer for sale, operate or permit to be operated a claxon installed on any motor vehicle of a model year nineteen hundred seventy-four and thereafter which, when operated, creates a sound level beyond the parameter of eighty-eight plus or minus 10 dB(A) when measured at a distance of fifty feet from the center of the forward face of such motor vehicle; but this section shall not preclude the sale or use of a city-country horn in accordance with allowable sound levels promulgated by the commissioner.

**§ 24-240 Emergency signal devices.** After June thirtieth, nineteen hundred seventy-three, no person shall operate or permit to be operated an emergency signal device installed on an authorized emergency vehicle which when operated creates a sound level in excess of 90 db(A) when measured at a distance of fifty feet from the center of the forward face of such vehicle.

**§ 24-241 Paving breakers.** (a) On or after September thirty-first, nineteen hundred seventy-two, no person shall operate or cause to be operated a paving breaker, other than one operated electrically or hydraulically, manufactured prior to December thirty-first, nineteen hundred seventy-three, unless a pneumatic discharge muffler certified by the manufacturer of such muffler to provide a dynamic insertion loss of 5 db(A) of the sound released from the air discharge of such paving breaker is installed on such air discharge.

(b) No person shall sell, offer for sale for use within the city of New York, operate or permit to be operated a paving breaker manufactured on or after the effective dates set out in table IV which when operated produces a maximum sound level, when measured at a distance of one meter from a face of such paving breaker, exceeding the applicable allowable sound level set out therein.

TABLE IV

Effective date	Allowable sound level
December 31, 1973	103 dB(a)
December 31, 1978	100 dB(A)
December 31, 1981	95 dB(A)

**§ 24-241.1 Commercial music.** No person shall make or cause or permit to be made or caused any music originating from or in connection with the operation of any commercial establishment or enterprise when the level of sound of such music, as measured inside any residential unit is in excess of either;

(a) 45dB(A) as measured with a sound level meter; or

(b) 45dB in any one-third octave band having a center frequency between 63 hertz and 500 hertz inclusive (ANSI bands numbers 18 through 27, inclusive, in accordance with American national standards institute standard S1.6-1984).

**§ 24-242 Regulations.** The commissioner shall promulgate such regulations as he or she may deem necessary with regard to standards and



**§ 24-242**

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procedures to be followed in the measurement of sound pressure levels governed by the provisions of this subchapter, provided that such standards and procedures are substantially in compliance with any similar standards and procedures promulgated by the American national standards institute, international standards organization, society of automotive engineers, compressed air and gas institute, American refrigeration institute or any other generally recognized professional standard-setting organization.

## Subchapter 6

### *Ambient Noise Quality Zones, Criteria and Standards*

§ 24-243 Ambient noise quality zones, criteria and standards.

§ 24-244 Allowable sound levels.

§ 24-243 Ambient noise quality zones, criteria and standards. (a) Ambient noise quality zones.

Ambient noise quality zones are herein defined for the entire geographical area of the city of New York on the basis of those conditions which affect ambient noise levels, including but not limited to the following:

- (1) The use and activities permitted by the zoning regulations in such zones;
- (2) The intensity of sound levels produced by activities and devices in such zones;
- (3) The time at which such sound levels occur;
- (4) The duration of such sound levels;
- (5) The proximity of such activities and devices to buildings and to dwellings;
- (6) Whether the sound levels produced by such devices and activities are recurrent, intermittent, or constant; and
- (7) The density of habitation of such zones.

Ambient noise quality zones are hereby formulated on the basis of present existing land-use zones, as follows:

- (1) Ambient noise quality zone N-1:

Ambient noise quality zone N-1 shall consist of those low-density residential areas  $R_L$  presently designated as land-use zones R-1, R-2, and R-3.

- (2) Ambient noise quality zone N-2:

Ambient noise quality zone N-2 shall consist of those higher-density residential areas  $R_H$  presently designated as land-use zones R-4, R-5, R-6, R-7, R-8, R-9, and R-10.

- (3) Ambient noise quality zone N-3:

Ambient noise quality zone N-3 shall consist of all commercial and industrial areas presently designated as land-use zones C-1, C-2, C-3, C-4, C-5, C-6, C-7, C-8, M-1, M-2, and M-3.

(4) Other ambient noise quality zones:

Should other land-use zones be established, including special zoning districts, the commissioner shall recommend to the city council the appropriate ambient noise quality zones, criteria, and standards.

(b) Ambient noise quality criteria and standards.

Ambient noise quality criteria and standards are herein established and tabulated below for each of the three ambient noise quality zones that have been defined in subdivision (a) above. Not included in the standard are contributions to the sound level from natural sounds such as birds and thunder and sound sources outside the boundaries of the noise source such as public highways, vehicular traffic and overflying aircraft.

Ambient noise quality zone	Day-time standards (7am - 10pm)	Night-time standards (10pm - 7am)
Noise quality zone N-1 (Low density residential R <sub>L</sub> ; land-use zones R-1 to R-3)	Leq = 60 dB(A) measured for any one hour	Leq = 50 dB(A) measured for any one hour
Noise quality zone N-2 (High density residential R <sub>H</sub> ; land-use zones R-4 to R-10)	Leq = 65 dB(A) measured for any one hour	Leq = 55 dB(A) measured for any one hour
Noise quality zone N-3 (All commercial and manufac- turing land-use zones)	Leq = 70 dB(A) measured for any one hour	Leq = 70 dB(A) measured for any one hour

(1) These criteria and standards as set forth in this section shall apply to all stationary activities and to all mobile activities whenever they may be stationary, with the following exceptions:

(i) Construction activities conforming with section 24-224 of the code.

(ii) Devices, vehicles, equipment and other noise producing items or circumstances for which provisions are set forth elsewhere in the code.

(iii) Mechanical equipment conforming with section 27-770 of the code.

(iv) Premises conforming with noise control performance standards as specified in the zoning resolution of the city of New York and set forth on a certificate of occupancy as issued by the department of buildings.

(v) Any other premise occupied in conformance with a certificate of occupancy as issued by the department of buildings prior to November eighteenth, nineteen hundred seventy-nine, provided, however, that in no event shall the noise levels exceed those allowable in a N-3 ambient noise quality zone or their present noise level whichever is less.

(2) All new activities not exempt by paragraph one of subdivision b of this section shall fall under the jurisdiction of this section of the noise control code upon November eighteenth, nineteen hundred seventy-nine.

(3) Three years from October nineteenth, nineteen hundred eighty-two all activities not exempt by paragraph one of subdivision b of this section shall meet these specified noise criteria.

(4) Activities not exempt by paragraph one of this subdivision in a given noise quality zone shall not cause the sound levels in any lower noise quality zone to exceed the appropriate standards of section 24-243 of the code for the lower noise zone.

(5) All noise measurements shall be made at the property line of the impacted site. When instrumentation cannot be placed at the property line, the measurement shall be made as close thereto as is reasonable. However, noise measurements shall not be made at a distance less than twenty-five feet from the edge of a noise source.

(6) Where residential noise quality zones (N-1 and N-2) presently exhibit noise levels lower than 55dB(A), no new activity in any zone, with the exception of new housing or new low occupancy commercial uses shall be permitted to increase the daytime hourly Leq above 55dB(A) or the nighttime hourly Leq above 45dB(A), when measured at or referred to an impacted residential property line.

(7) All new limited-access highways hereinafter constructed or substantially reconstructed highways built in the city of New York must be designed to provide that the hourly equivalent noise levels at the property line of the nearest residence does not exceed 67dB(A).

(8) Commercial district noise standards shall apply to legally occupied mixed buildings used partly for residential use and partly for commercial or manufacturing uses between the hours of seven a. m. to ten p. m. No one shall conduct or permit to be conducted activities associated with these commercial establishments that cause the Leq noise levels, measured for any thirty minutes in the sleeping areas of nearby residences, to exceed 45dB(A) between ten p. m. and the following seven a. m.

(9) The ambient noise quality criteria and standards cited above are not presently adjusted for particular noise sources having pure tones or impulsive noise characteristics, such as jet engine whine and pile drivers, respectively. Such characteristics shall be considered in the development of allowable sound levels for sources, as part of section 24-244 of this code.

(10) Allowable sound levels to be promulgated under section 24-244 of this code shall be based on the latest economically feasible and available technology for the abatement of noise produced by devices and activities within a referent ambient noise quality zone.

(11) After the effective date of enactment of these regulations, the commissioner shall submit a supplementary report to the city council every two years that will (i) update the description of existing noise levels in New York City, (ii) evaluate the continued validity of maintaining the noise zone groupings as shown in subdivision (a) above, (iii) evaluate the practicality and the economic impact of reducing existing noise levels, based on applying the latest available noise abatement technology, and (iv) make specific recommendations for modifications that will update and improve ambient noise quality criteria and standards.

(12) The criteria and standards in this section shall not apply to noise emissions from safety devices or emergency equipment required to protect or to service electric, gas, water, sewer, steam or telephone systems when these devices are functioning in their emergency mode. Conditions for the use to test or exercise this equipment shall be subject to the approval of the commissioner. Should such devices operate so as to cause repetitive complaints the commissioner may after public hearing require compliance with this section.

(c) Variances procedure.

(1) The commissioner may grant individual variances beyond the limitations prescribed in these criteria and standards whenever it is found, upon presentation of adequate proof, that compliance with any of the provisions of these criteria and standards or with any regulation or order of the commissioner in respect thereto, would impose unreasonable hardships or if the same is necessary in the interest of public welfare. In granting a variance the commissioner may impose such conditions as he or she may determine are necessary or desirable to carry out the policies of these criteria and standards. The text of such variance shall be published in the City Record together with a statement of the facts and reasons therefor.

(2) Any variance granted pursuant to this section shall be granted for such period of time as shall be specified by the commissioner in such variance and upon the condition that the person who receives such variance shall comply with all conditions thereof and shall make such periodic progress reports as the commissioner shall specify. The duration of a variance maybe limited by the commissioner as follows:

(i) For short duration emergency conditions a variance for a period of up to one week shall be granted for all situations recognized by the commissioner as an emergency. However, full justification for such variance must be submitted within one week.

(ii) For temporary conditions, or to conduct noise impact assessment tests in accordance with a plan submitted to and approved by the department, a variance for a period of up to six months may be granted.

(iii) Any person seeking a variance shall do so by filing a petition in a form acceptable to the commissioner, and shall also submit an assessment of the noise impact to be caused by the activity for which the variance is requested.

**§ 24-244 Allowable sound levels.** (a) On or after November eighteenth, nineteen hundred seventy-nine, the commissioner may by regulation promulgate allowable sound levels with respect to any device or activity, provided that such allowable sound levels shall not be inconsistent with the ambient noise criteria and standards enacted under section 24-243 of this subchapter, with the allowable sound levels set out in subchapter five of this chapter of this code, and with the provisions of chapter one of title twenty-seven of the code.

(b) No person shall engage in or cause any other person to engage in an activity, or operate or permit the operation of a device so as to cause a sound level in excess of the appropriate allowable sound level promulgated by the commissioner pursuant to this section.



## Subchapter 7

### *Certificates and Tunneling Permits*

- § 24-245 Operating certificates and renewal of operating certificates; tunneling permits; when required.
- § 24-246 General requirements for applications for operating certificates and for tunneling permits, and removal of operating certificates.
- § 24-247 Information required for applications for operating certificates and for tunneling permits.
- § 24-248 Standards for granting operating certificates and tunneling permits.
- § 24-249 Testing before granting or renewing of operating certificates; testing before granting of tunneling permits.
- § 24-250 Action on applications for certificates or tunneling permits.
- § 24-251 Conditions of certificates or tunneling permits to be observed.
- § 24-252 Suspension or revocation of certificates or tunneling permits.
- § 24-253 Surrender of certificates or tunneling permits.
- § 24-254 Transfer of certificates.
- § 24-255 Operating certificate or tunneling permit fees.
- § 24-256 Departmental publication fees.

**§ 24-245 Operating certificates and renewal of operating certificates; tunneling permits; when required.** (a) The commissioner shall at his or her discretion promulgate regulations pursuant to section eleven hundred five of the city charter directing the placement of air compressors, paving breakers, refuse compacting vehicles and rapid transit railroads, including but not limited to their rolling stock, track and track beds, passenger stations, tunnels, elevated structures, yards, depots and garages, onto an operating certificate list, setting out the reasons for such placement, and setting out the period of time from issuance or renewal during which such operating certificate shall be valid, unless sooner revoked or cancelled.

(b) No person shall cause or permit the use or operation of any device placed on the operating certificate list pursuant to subdivision (a) of this section except for the purpose of testing such device without first obtaining an operating certificate from the commissioner. The placement of such a device not bearing an operating certificate at a location of its customary operation shall be considered a violation of this section in any proceeding pursuant to any applicable section of subchapter eight of this chapter of this code except section 24-269.



(c) No person shall engage in or permit any person to engage in tunneling without first obtaining a tunneling permit from the commissioner. A separate permit shall be obtained for each shaft of a tunnel.

(d) Prior to advertising for bids for contracts involving tunneling, the agency of the city of New York proposing to so advertise shall request the commissioner in writing for a statement of the requirements or standards that will govern the proposed tunneling activities pursuant to section 24-248 of this subchapter. The aforesaid requirements shall be furnished by the commissioner to the contracting agency in writing within thirty days after receipt of the request and shall be included by the contracting agency in the contract specifications for the proposed tunneling. The conditions under which the permit shall be granted to the contractor shall be consistent with the statement furnished by the commissioner to the contracting agency for inclusion in the contract specifications.

(e) Notwithstanding the existence of a valid tunneling permit, no person shall, except in the case of urgent necessity in the interest of public safety, conduct or permit to be conducted blasting operations at any time other than on weekdays and other than between the hours of seven a. m. and seven p. m. unless a special permit is obtained from the fire department pursuant to subdivision d of section 27-4039.

**§ 24-246 General requirements for applications for operating certificates and for tunneling permits, and removal of operating certificates.** (a) Application for an operating certificate or for the removal of an operating certificate shall be made by the owner of the device on forms furnished by the department.

(b) Application for a tunneling permit shall be made on forms furnished by the department by or in behalf of the owner or lessee of the tunnel; and if made by a person other than the owner, the application shall be accompanied by a signed statement of the applicant declaring that he or she is authorized by the owner to make the application. The permittee shall in all cases by the applicant.

(c) Each application hereunder shall be signed by the applicant. The signature of the applicant shall constitute an agreement that the applicant will assume responsibility for the operation or use of the device concerned or for tunneling in accordance with the requirements of this code. If the applicant is a partnership or group other than a corporation, the application shall be made by one individual who is a member of the group. If the applicant is a corporation, the application shall be made by an officer of the corporation.

(d) Application for the removal of an operating certificate shall be postmarked or date-stamped by the department upon personal delivery no later than thirty days prior to the expiration of the certificate.

**§ 24-247 Information required for applications for operating certificates and for tunneling permits.** (a) Each application for an operating certificate shall contain such information as the commissioner may require in order to determine whether a device covered by the application is or will operate in compliance with the provisions of this code, including but not limited to:

(1) The model number and operating characteristics of the device covered by the application;

(2) A report certified by an approved testing laboratory as to the sound level generated by the device when operated under normal operating conditions or a manufacturer's warranty as to sound level provided that the device is regularly tested in accordance with procedures established by the American national standards institute or other appropriate professional standard-setting organization listed in section 24-242; and

(3) The proposed means, if any, for the prevention or control of unreasonable noise.

(b) Each application for a tunneling permit shall contain such information as the commissioner may require to determine whether tunneling activities and the devices operated therein will be undertaken in compliance with the provisions of this code, including but not limited to:

(1) The types and operating characteristics of the devices employed in such tunneling;

(2) A detailed description of proposed tunneling; and

(3) The proposed means for the prevention of unreasonable noise.

(c) Information concerning secret processes which may be required, ascertained or discovered by the department shall not be disclosed by any department employee, except that the information may be disclosed by the commissioner if the department is subpoenaed for the information or if in the course of a departmental court proceeding or departmental or board hearing, the information is relevant to the proceeding or hearing.

**§ 24-248 Standards for granting operating certificates and tunneling permits.** (a) No operating certificate shall be granted unless the applicant shows to the satisfaction of the commissioner that:

(1) The device will be operated without causing a violation of the provisions of this code; and

(2) The device incorporates advances in the art of noise control developed for the kind and level of noise emitted by the applicant's device.

(b) No tunneling permit shall be granted unless the applicant shows to the satisfaction of the commissioner that:

(1) The devices employed in such tunneling, including construction devices, storage bins and hoppers, will be operated or used without causing a violation of the provisions of this code;

(2) The motor vehicles employed in such tunneling will be routed at such times of day and such routes as not to cause unreasonable noise; and

(3) All advances in the art of noise control, including appropriate closures around devices, and sound deadening linings on storage bins and hoppers, developed for the kind and level of noise emitted by applicant's activities or devices have been incorporated into such tunneling activities and devices.

(c) The commissioner may from time to time issue regulations for the guidance of applicants indicating the technical specifications which he or she deems will comply with the performance standards of this section.

**§ 24-249 Testing before granting or renewing of operating certificates; testing before granting of tunneling permits.** (a) Before a tunneling permit is granted or before an operating certificate is granted or renewed, the commissioner may require the applicant to conduct such tests as are necessary in the opinion of the commissioner to determine the sound level emitted from a device or an activity or to determine whether the device or its operation or an activity is contributing to, or is in violation of this code. The test shall be made at the expense of the applicant.

(b) Such test shall be conducted, reviewed and certified as provided by subdivision (b) of section 24-206 of this code. The applicant shall notify the department of the time and place of a test as provided by subdivision (c) of section 24-206 of this code. Reasonable facilities shall be made available for the department to witness the test.

If in the opinion of the commissioner tests by the department are necessary, the facilities for such tests, exclusive of sound level meters, shall be furnished by and at the expense of the owner or lessee or his or her agent as provided by subdivision (d) of section 24-206 of this code.

**§ 24-250 Action on applications for certificates or tunneling permits.**

(a) The commissioner shall act within a reasonable time not to exceed sixty days on an application for a tunneling permit, for an operating certificate, or for a renewal of an operating certificate, and shall notify the applicant in writing of his or her approval or disapproval of the application.

(b) If an application is disapproved, the commissioner shall set forth his or her objections in the notice of disapproval or notice of violation.

(c) Within sixty days after service on the applicant of the notice of disapproval, exclusive of the day of service, the applicant may request the commissioner to reconsider the application by answering in writing the commissioner's objection to the application.

(d) The commissioner shall consider the applicant's answer to his or her objections, and shall notify the applicant in writing within a reasonable time, not to exceed sixty days, of his or her approval or denial of the application. Failure to answer or request an extension of time within sixty days after service of the notice of disapproval or a notice of violation shall be deemed a denial of the application.

(e) The commissioner may grant a temporary operating certificate or tunneling permit for a period not to exceed sixty days upon receipt of an application for the granting or renewal of an operating certificate and may, at his or her discretion, renew a temporary operating certificate or tunneling permit for an additional period not to exceed sixty days.

**§ 24-251 Conditions of certificates or tunneling permits to be observed.** The holder of a certificate or of a tunneling permit shall comply with the conditions and terms contained in his or her certificate or tunneling permit as well as all applicable provisions of this code.

**§ 24-252 Suspension or revocation of certificates or tunneling permits.**

(a) The commissioner shall suspend or revoke a tunneling permit or certificate when ordered to do so by the board pursuant to subchapter eight of this chapter of this code.

(b) Suspension or revocation of a certificate or tunneling permit shall become final five days after service of notice, exclusive of the day of service, on the holder of the certificate or tunneling permit.

**§ 24-253 Surrender of certificates or tunneling permits.** A certificate or tunneling permit which has been cancelled or revoked pursuant to this code shall be surrendered forthwith to the commissioner.

**§ 24-254 Transfer of certificates.** Any purported or attempted transfer of a certificate automatically revokes the certificate, except that upon a conveyance of the premises in which the device is located a certificate may be transferred to a person other than the person named in the certificate.

**§ 24-255 Operating certificate or tunneling permit fees.** (a) A person applying for an operating certificate, or a renewal of an operating certificate shall pay a fee of thirty dollars.

(b) A person applying for a tunneling permit shall pay a fee of two hundred and fifty dollars.

**§ 24-256 Departmental publication fees.** The department may charge for a copy of its publications a fee in an amount not to exceed the unit cost of the preparation and distribution of the publication.



## **Subchapter 8**

### *Enforcement*

§ 24-257	<b>Powers of the board.</b>
§ 24-258	<b>The board.</b>
§ 24-259	<b>Notice of violation.</b>
§ 24-260	<b>Written response.</b>
§ 24-261	<b>Citizen's complaint.</b>
§ 24-262	<b>Settlement of proceedings.</b>
§ 24-263	<b>Hearings.</b>
§ 24-264	<b>Default; vacating a default order.</b>
§ 24-265	<b>Hearing officer's decision.</b>
§ 24-266	<b>Board decision and order.</b>
§ 24-267	<b>Compliance with board decisions; orders and civil penalties.</b>
§ 24-268	<b>Procedural rules.</b>
§ 24-269	<b>Criminal penalties.</b>

**§ 24-257 Powers of the board.** (a) The board, in addition to other duties assigned to it by law, shall have the power to conduct hearings pursuant to this subchapter and, by the issuance of a subpoena, compel the attendance of witnesses and the production of any books, papers or other things relating to the matter under investigation.

(b) The board may, upon notice pursuant to section 24-259 of this code, and after a hearing pursuant to section 24-263 of this code, or in default thereof pursuant to section 24-264 of this code:

(1) Order the commissioner to revoke or suspend a certificate or tunneling permit issued pursuant to this code for any device or activity where such device or activity causes, or is maintained or operated so as to cause a violation of any provision of this code or order or regulation promulgated by the commissioner or the board;

(2) Order the owner of any device which causes or is maintained or operated so as to cause a violation of any provision of this code or any order or regulation promulgated by the commissioner or the board, to install any apparatus which can reasonably be expected to correct the violation, or to repair, properly maintain, replace or alter such device in a manner which can reasonably be expected to correct the violation;

(3) Seal any device which causes or is maintained or operated so as to cause a violation of any provision of this code or order or regulation promulgated by the commissioner or the board, except as provided in subdivision (c) of this section;

(4) Order any person to cease and desist from any activity which causes or is conducted so as to cause a violation of any provision of this code or any

order or regulation promulgated by the commissioner or the board, except as provided in subdivision (c) of this section;

(5) Impose a civil penalty in each instance in an amount as set out in table V against any person who violates a provision of this code, or of any order, rule or regulation promulgated by the commissioner or the board.

**TABLE V**

Violations related to section and subdivision	Civil Penalties					
	First Violation		Second Violation*		Third and Subsequent Violations*	
	Maxi- mum	Mini- mum	Maxi- mum	Mini- mum	Maxi- mum	Mini- mum
24-216 (d) . . . . .	\$2,625	650	5,250	1,300	7,875	1,950
24-218 . . . . .	875	220	1,750	440	2,625	660
24-220 (a) . . . . .	350	90	700	180	1,050	270
24-220 (b) . . . . .	1,750	440	3,500	880	5,250	1,320
24-220 (c) . . . . .	175	45	350	90	525	135
24-220 (d) . . . . .	3,500	875				
24-221 (a) . . . . .	875	220	1,750	440	2,625	660
24-221 (b), (c), (d), (e), (j) . .	700	175	1,400	350	2,100	525
24-221 (g) . . . . .	250	100	500	200	750	300
24-222 . . . . .	175	45	350	90	525	135
24-223 . . . . .	875	220	1,750	440	2,625	660
24-224 . . . . .	3,500	875	7,000	1,750	10,500	2,625
24-225 . . . . .	1,400	350	2,800	700	4,200	1,050
24-226 . . . . .	1,400	350	2,800	700	4,200	1,050
24-227 . . . . .	1,400	440	2,800	880	4,200	1,320
24-227.1 . . . . .	875	100	1,750	200	2,625	300
24-227.2 . . . . .	875	220	1,750	440	2,625	660
24-228 . . . . .	875	220	1,750	440	2,625	660
24-229 . . . . .	1,400	440	2,800	880	4,200	1,320
24-232, except that this \$440- \$1,400 civil penalty shall apply only to a violation by a person operating motor vehicles listed in subdivisions one and two of Column I, and sub- divisions one and two of Column II, of Table 1 and						

except that this \$880-\$2,800 civil penalty shall apply only to a second violation by a person operating such motor vehicles and except that this \$1,320-\$4,200 civil penalty shall apply only to a third or subsequent violation by a person operating such motor vehicles . . .	1,400	440	2,800	880	4,200	1,320
24-232, except that this \$130-\$525 civil penalty shall apply only to a violation by a person operating motor vehicles listed in subdivision three of Column I, and subdivision three of Column II, of Table 1 and except that this \$260-\$1,050 civil penalty shall apply only to a second violation by a person operating such motor vehicles and except that this \$390-\$1,575 civil penalty shall apply only to a third or subsequent violation by a person operating such motor vehicles . . . . .	525	130	1,050	260	1,575	390
24-234 . . . . .	2,625	660	5,250	1,320	7,875	1,980
24-236 . . . . .	1,400	440	2,800	880	4,200	1,320
24-237, except that this \$440-\$1,400 civil penalty shall apply only to a violation of section 24-237 with respect to a circulation device with a rated capacity equal to or greater than fifty thousand British thermal units per hour or its equivalent and except that this \$880-\$2,800 civil penalty shall apply only to a second violation of section 24-237 with respect to such a circulation device and except that this \$1,320-\$4,200 civil penalty shall apply only to a third or subsequent						



violation of section 24-237 with respect to such a circulation device . . . .	1,400	440	2,800	880	4,200	1,320
24-237, except that this \$130-\$525 civil penalty shall apply only to a violation of section 24-237 with respect to a circulation device with a rated capacity of less than fifty thousand British thermal units per hour or its equivalent and except that this \$260-\$1,050 civil penalty shall apply only to a second violation of section 24-237 with respect to such a circulation device and except that this \$390-\$1,575 civil penalty shall apply only to a third or subsequent violation of section 24-237 with respect to such a circulation device . . . .	525	130	1,050	260	1,575	390
24-238 . . . . .	1,400	440	2,800	880	4,200	1,320
24-239 . . . . .	525	130	1,050	260	1,575	390
24-240 . . . . .	1,400	440	2,800	880	4,200	1,320
24-241 . . . . .	1,400	440	2,800	880	4,200	1,320
24-241.1 . . . . .	8,000	2,000	16,000	4,000	24,000	6,000
24-243 . . . . .	2,625	660	5,250	1,320	7,875	1,980
24-244 . . . . .	1,750	440	3,500	880	5,250	1,320
24-245 . . . . .	2,625	660	5,250	1,320	7,875	1,980
All remaining sections and subdivisions	875	220	1,750	440	2,625	660

\* *By the same respondent of the same provision of law, order, rule or regulation and, if the respondent is the owner, agent, lessee or other person in control of the premises with respect to which the violation occurred, at the same premises (all violations committed within two years).*

Each day during which such violation continues shall constitute a separate violation. The board may remit, in whole or in part, such a civil penalty if, at the conclusion of the hearing or at the time of the board determination under section 24-266 of this code, the respondent is no longer in violation of a provision of this code, or of any order, rule or regulation promulgated by the commissioner or the board;

(6) Impose a civil penalty of not more than two hundred fifty dollars on any owner of a device for each day such equipment is sealed pursuant to this section;

(7) Impose a civil penalty of not less than one thousand nor more than four thousand dollars on any person who willfully breaks, or causes or permits the breaking of, a seal placed on a device pursuant to this section.

(8) Impose an additional civil penalty in the amount of twenty-five percent of that which would otherwise be imposed for each twelve decibels by which the sound or noise level measured exceeds the maximum sound level as contained in subchapters five and six of this chapter.

(9) Impose an additional civil penalty in the amount of ten percent of the penalty originally imposed, for late payment of penalty for each month, or part thereof, that the penalty payment is in arrears. In no event shall the total additional civil penalty exceed the maximum set forth in the table of civil penalties, or as modified pursuant to paragraph eight of this subdivision or paragraph ten of this subdivision, or both.

(10) Order any person to be classified as a persistent violator if such person is found to be in violation of this code and has also on one or more prior occasions within the preceding five years been found to be in violation of this code, where such repeated violations evidence substantial [*sic*]<sup>1</sup> disregard thereof. If a person is classified as a persistent violator, the board shall in each instance double the amount of the penalty which it would otherwise impose pursuant to paragraph five of this subdivision. Such double penalties shall be imposed for violations which the board finds a person committed pursuant to the same proceeding at which it classified such person as a persistent violator and for all violations committed within two years immediately following such classification, after which [*sic*]<sup>2</sup> such classification shall terminate. However, if at the end of such two year period such person is still in violation of this code because of a failure to take or complete a corrective action as required by the board, such classification shall continue until such time as such person is no longer in violation of this code because of such failure, at which time such classification shall cease. Thereafter, the board may again classify such person as a persistent violator, on the same basis it used originally.

(c) The board may, upon notice pursuant to section 24-259 of this code:

(1) order any person to cease and desist from the operation of any listed device without a certificate as required by section 24-245 of this code and the board may also seal such device;

(2) order any person to cease and desist from tunneling without a tunneling permit as required by section 24-245 of this code and the board may also seal any device used in such tunneling;

(3) order any person not in possession of a variance issued pursuant to subdivision (b) of section 24-224 of this code to cease and desist from construction activities other than during the permissible hours specified in subdivision (a) of section 24-224 of this code and the board may also seal any device used in such construction activities;

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1. Probably should be "substantial".

2. Probably should be "which".

(4) order any person to cease and desist from the operation of a device without registration required by section 24-208 of this code and the board may also seal such device.

(d) The board may order the commissioner to install any apparatus or to repair or alter any device or apparatus which causes or is maintained or operated so as to cause a violation of an order issued pursuant to paragraph two of subdivision (b) of this section, where such repairing or alteration can reasonably be expected to correct such a violation. Any work required under such an order may be executed by the commissioner through the officers, agents or contractors of the department. The department shall be reimbursed promptly for all costs and expenses of such work by the owner of the device to which the order relates and in respect to which such expenses were incurred. Such expenses may be recovered in a civil action brought in the name of the commissioner.

(e) If an order of the board issued pursuant to subdivisions (b) and (c) of this section provides for a period of time during which a person subject to the order is permitted to correct a violation, the board may require the respondent to post a performance bond or other security with the department in a form and amount sufficient to assure the correction of such violation within the prescribed time. In the event of a failure to meet the schedule prescribed by the board, the sum named in the bond or other security shall be forfeited and shall be paid to the commissioner.

(f) (1) The board may order any person to cease and desist from an activity which it reasonably believes causes unreasonable noise which creates imminent peril to the public health and well being, or to cease and desist from an activity which it reasonably believes constitutes a wilful or continued violation of any provision of this code or order or regulation, promulgated by the commissioner or board. Such order shall be effective upon service thereof. Any party affected by such an order may request a hearing on written notice, and he or she shall be afforded a hearing, within twenty-four hours after service of such request, pursuant to section 24-263 of this code. If such an accelerated hearing is not requested, then a hearing shall be afforded within ten days of the issuance of the order. The board shall issue its final decision and order thereon within three days from the conclusion of a hearing held pursuant to this subdivision.

(2) The board may rescind in whole or in part a variance issued by an agency of the city of New York pursuant to subdivision (b) of section 24-224 of this code. Such order shall be effective upon service thereof upon such agency and upon the person to whom such variance was issued.

**§ 24-258 The board.** (a) The board shall be convened by the chairperson, or in the chairperson's absence the assistant commissioner of air resources, or at the request of any three members thereof.

(b) If a member of the board has presided over the initial hearing, he or she shall not be disqualified from reviewing the hearing.

(c) Five members of the board, at least two of whom shall not be city officials, shall constitute a quorum.

**§ 24-259 Notice of violation.** (a) Notice, required by this chapter, shall be given by issuance of a notice of violation.

(b) Whenever the commissioner has reasonable cause to believe that a violation of any provision of this code or any order or regulation promulgated by the commissioner or the board may exist, he or she may cause to have a notice of violation issued and served on:

- (1) The person in violation; or
- (2) An owner with an equity interest in the device in violation, if any; or

(3) If an owner with an equity interest in the device in violation cannot be located with due diligence, any other owner of said device.

(c) A notice of violation shall:

(1) Specify the section or sections of this code, order, or regulation that such person or device is in violation of; and

(2) Indicate the amount of the civil penalty that such person is subject to; and

(3) Contain a brief statement of the nature of the violation; and

(4) Require a written response that conforms to section 24-260 of this code; and

(5) Require such person or owner of a device, unless a hearing is not required by section 24-257 of this code, to answer the allegations in the notice of violation at a time and place designated either in or with the notice of violation or in a subsequent notice to such person or owner.

**§ 24-260 Written response.** (a) A written response in a form prescribed by the board shall be served upon the department and filed with the board within five days of receipt of the notice of violation.

(b) If the allegation in the notice of violation is one for which a hearing is not required by section 24-257 of this code, and is contested, then the respondent must either:

(1) Include a copy of any tunneling permit or certificate that the respondent asserts was issued by the department; or

(2) Deny that such tunneling permit or certificate is required by law.

(c) If any of the allegations in the notice of violation are those for which a hearing is required by section 24-257 of this code, and are contested, the written response shall contain a concise statement of the facts constituting each ground of defense.

(d) If allegations in the notice of violation are admitted the written response of the respondent shall consist of:

(1) A statement that he or she admits all of the material allegations to be true; and

(2) A statement of any attempts subsequent to service of the notice of violation to comply with this code or with the order or regulation.

(e) Failure of the respondent to serve a written response within the time provided shall be deemed to constitute a waiver of his or her right to appear and contest the allegations in the notice.

**§ 24-261 Citizen's complaint.** (a) Any person other than personnel of the department and employees of the city of New York authorized by law to serve summonses for violation of the code may serve upon the department a complaint in a form prescribed by the commissioner alleging that a person has violated a provision of this code set forth in table VI, below, or an order or regulation promulgated under such provision together with evidence of such violation.

Table VI

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**Violation related to  
section or subdivision  
and order or regulation  
thereunder**

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24-208

24-216

24-220 (b)

24-224

24-232, except that the provisions of this section 24-261 shall apply only to violations by persons operating motor vehicles listed in subdivisions one and two of column I, and subdivisions one and two of column II of Table 1. 24-234 24-236 24-237, except that the provisions of this section 24-261 shall apply only to a violation by a person operating a circulation device with a rated capacity in excess of fifty thousand British thermal units per hour or its equivalent.

24-238

24-240

24-241

24-244

24-245

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(b) A person who has served a complaint pursuant to subdivision (a) of this section may serve upon the person allegedly in violation and upon the board a notice of violation in a form prescribed by the board, if within thirty days from service of such complaint:

(1) The department has failed to serve a notice of violation, pursuant to section 24-259 of this code, for the violation alleged in a complaint pursuant to subdivision (a) of this section; or

(2) The department fails to serve a written notice upon the complainant of its determination that his or her complaint is frivolous or duplicitous.

(c) A person commencing a proceeding before the board pursuant to this section, shall prosecute such proceeding at his or her own expense. The department may intervene in such a proceeding at any time.

(d) In any proceeding brought by the department after receiving a complaint pursuant to subdivision (a) of this section, the board shall award the complainant, out of the proceeds collected, fair and reasonable compensation, which shall not exceed twenty-five percent of the proceeds collected, for disclosure of information or evidence not in the possession of the department, which leads to the imposition of the civil penalty.

(e) In any proceeding brought by a complainant, the board shall award, out of the proceeds collected, fifty percent of any civil penalty as fair and reasonable compensation to such person.

**§ 24-262 Settlement of proceedings.** The board may settle any proceeding by stipulation and may exercise any or all of its powers under section 24-257 of this code thereby, at any time prior to the issuance of a decision pursuant to section 24-266 of this code.

**§ 24-263 Hearings.** (a) The chairperson of the board shall designate a hearing officer or at least one member of the board to preside over hearings held pursuant to this subchapter. In any hearing in which a quorum of the board is present, such members shall be deemed to be sitting as the board.

(b) All such hearings shall be open to the public.

(c) At the request of any party to such a hearing, the board shall by the issuance of a subpoena compel the attendance of such witnesses and shall require the production of any such books, papers, or other things relating to the matter under investigation if such a request reasonably relates to such hearing.

(d) Any party to a hearing may be represented by counsel, may make oral and written argument and cross-examine witnesses. All testimony taken before the board or the designated hearing officer shall be under oath and shall be recorded. The record shall be open to public inspection, and copies thereof shall be made available to any person upon payment of the actual cost of reproduction.

**§ 24-264 Default; vacating a default order.** (a) A respondent shall be in default when the respondent has:

(1) Failed to serve a written response pursuant to section 24-260 of this code; or

(2) Failed to appear at the designated time and place as required by the notice of violation or subsequent notice pursuant to section 24-259 or 24-261 of this code; or

(3) Neglected to proceed in a manner ordered by the board.

(b) Within sixty days of a decision and order of the board issued pursuant to paragraph two of subdivision (c) of section 24-266 of this subchapter, the respondent may request the board to grant a stay of such order of the board and schedule a hearing. If the respondent has shown good cause and a meritorious defense, the board may grant such a request and hold a hearing pursuant to section 24-263 of this code. At the conclusion of the hearing, the board may adopt, amend or rescind its decision and order.

**§ 24-265 Hearing officer's decision.** (a) At the conclusion of the hearing, the hearing officer or member of the board conducting the hearing shall prepare a decision stating findings of fact and conclusions, as well as reasons for his or her determination on all material issues, and making recommendations as to action which should be taken in the matter.

(b) The hearing officer or member of the board conducting the hearing shall file his or her decision with the board and send copies by mail to the parties. Any party may file exceptions with the board within twenty days after service of such decision. If no exceptions have been filed within the described time, the recommendations of the hearing officer or member of the board conducting the hearing shall automatically become the decision of the board and shall constitute its findings, conclusions and order.

(c) At the conclusion of a hearing conducted by the board, the board shall issue its decision and order. The decision of the board shall conform to the requirements of subdivisions (b) and (c) of section 24-266 of this code.

**§ 24-266 Board decision and order.** (a) If any party files exceptions to the decision of the hearing officer or member of the board conducting a hearing within the prescribed time the board shall review the record and issue its decision and order in which it may adopt, modify or reject the findings, conclusions and recommendations of the hearing officer or member of the board who conducted the hearing.

(b) The decision of the board shall contain findings of fact, conclusions of law and reasons for the decision on all material issues raised, and an order either dismissing the allegations of the notice of violation or sustaining them in whole or in part.

(c) The board may exercise one or more of its powers pursuant to section 24-257 of this code, as it deems appropriate if:

(1) The allegations in the notice of violation are sustained in whole or in part;

(2) The respondent is in default under section 24-264 of this code.

(d) The decision and order of the board shall be its final determination. A judicial proceeding must be commenced within two months after the service of such decision and order.



**§ 24-267 Compliance with board decisions; orders and civil penalties.** (a) If the respondent fails or refuses to comply with the board's order, or the board otherwise deems it necessary, the corporation counsel for the city of New York, acting in the name of the city, may maintain an action or proceeding in a court of competent jurisdiction to compel compliance with or restrain by injunction the violation of any order of the board.

(b) A civil penalty imposed by the board pursuant to section 24-257 of this code may be collected in an action brought in the name of the city of New York.

**§ 24-268 Procedural rules.** The board shall have authority from time to time to make, amend and rescind such procedural rules as may be necessary to carry out the provisions of this subchapter.

**§ 24-269 Criminal penalties.** (a) Any person who shall knowingly make a false statement or who shall knowingly falsify or allow to be falsified any certification, registration, form, signed statement, application or report required under the provisions of this code or regulation promulgated by the commissioner or the board shall be guilty of a misdemeanor and, upon conviction thereof, shall be punished by a fine of not less than one hundred dollars nor more than one thousand dollars, or by imprisonment not to exceed five months, or both.

(b) Any person, other than a corporation, who violates any order of the commissioner or the board or any provision of section 24-245 of this code or who illegally breaks a seal or equipment, upon conviction shall be punished for each offense by a fine of not less than fifty dollars nor more than five hundred dollars, or by imprisonment for not more than thirty days or by both.

Any corporation which violates any order of the commissioner or the board or any provision of section 24-245 of this code, or which illegally causes a seal to be broken, upon conviction shall be punished for each offense by a fine of not less than one hundred dollars nor more than two thousand dollars.

Every day during which such violation occurs constitutes a separate offense.

(c) Any person, other than a corporation, convicted of willful failure to pay a civil penalty imposed by the board pursuant to section 24-257 of this code shall be punished by a fine of double the amount of the civil penalty imposed by the board, or by imprisonment for not more than sixty days, or by both.

Any corporation convicted of a wilful failure to pay a civil penalty imposed by the board pursuant to section 24-257 of this code shall be punished by a fine of double the amount of the civil penalty imposed by the board, but not more than two thousand dollars.

(d) The failure of any person or corporation against whom an action has been brought to collect a civil penalty pursuant to subdivision (b) of section 24-267 of this code, who has been found liable by a court for such civil penalty and who does not pay such penalty after the judgment of such becomes final, shall be deemed guilty of a willful failure to pay a civil penalty.

(e) Any person convicted of violating any of the provisions of this code or any regulation of the board not otherwise provided for by this section shall be punished by a fine of not less than fifty dollars nor more than five hundred dollars for the first offense, or by imprisonment for twenty days, or both; and by a fine of not less than one hundred dollars nor more than one thousand dollars, or by imprisonment for not more than thirty days, or both, for a second offense; and by a fine of not less than four hundred dollars nor more than five thousand dollars, or by imprisonment for not more than four months or both for a third or subsequent offense.

(f) Twenty-five percent of any fine that is imposed pursuant to this section may be paid to the person or persons giving information which shall lead to conviction.



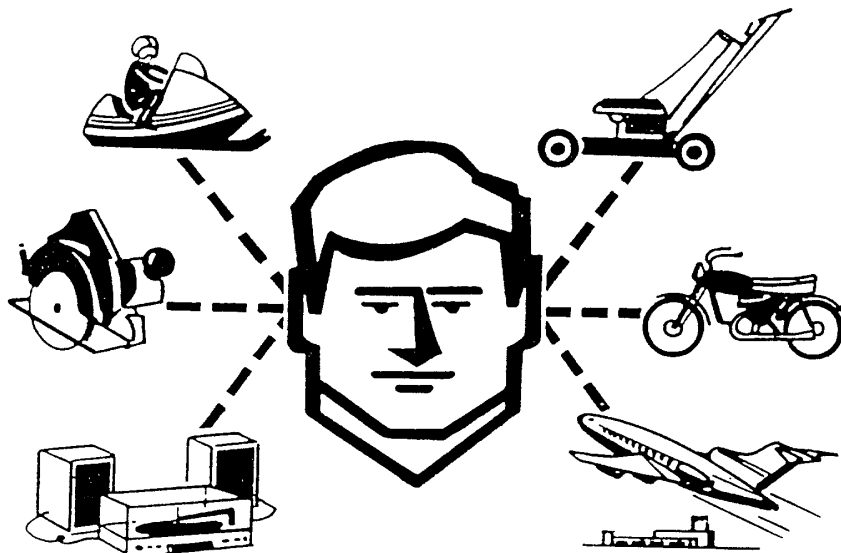
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環境音量監測參考文獻—

Community Noise Enforcement-

The States of New Jersey Rutgers

# COMMUNITY NOISE ENFORCEMENT



THE STATE UNIVERSITY OF NEW JERSEY

**RUTGERS**

NOISE TECHNICAL ASSISTANCE CENTER  
DEPARTMENT OF ENVIRONMENTAL SCIENCES

NEW JERSEY DEPARTMENT OF  
ENVIRONMENTAL PROTECTION

# COMMUNITY NOISE ENFORCEMENT

A manual to accompany the Short Course: 'Community Noise Enforcement.' A required course, pursuant to NJAC 7:29-2.11 'Qualifications of investigative personnel,' and resulting in certification recognized by jurisdictions across the United States.

Editor  
Eric M. Zwierling, M.S., Director  
Rutgers Noise Technical Assistance Center

Rutgers Noise Technical Assistance Center  
Rutgers, The State University of New Jersey  
Department of Environmental Sciences  
14 College Farm Road  
Cook College  
New Brunswick, NJ 08901-8551

Phone: (732) 932-8065  
Fax: (732) 932-8644  
E-mail: [Zwierling@envsci.rutgers.edu](mailto:Zwierling@envsci.rutgers.edu)  
Website:  
<http://www.envsci.rutgers.edu/estc/rntac/>

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## INTRODUCTION

In 1974, the EPA estimated that nearly 100 million Americans lived in areas where the daily average noise levels exceeded its identified safe  $L_{dn}$  (Day Night Level) of 55 dB (EPA, 1974). In 1990, that estimate had risen to 138 million people (Eldred, 1990).

Unregulated sources of noise can have impacts far beyond the obvious transitory nuisance, and complainants may be enduring more than simple annoyance. Exposure to loud noise has been shown to result in uncontrollable stress which can result in alterations in mood as well as hormonal and nervous system changes in healthy subjects (Brier, 1987). A lack of control over noise results in a variety of neurobiological and behavioral alterations, a phenomenon known as 'learned helplessness' (Brier, 1987). It has been demonstrated that blood pressure is reproducibly elevated in response to intermittent loud noise (Sawada, 1993). The noxious stimulus of noise has long been used as a laboratory model for producing stress because it results in the same biological and physiological responses as other stressors (Suter, 1992). Noise has been clearly implicated in sleep disturbance (Lukas, 1977), resulting in a cascade of negative effects (Suter, 1992). The stress, tension and fatigue associated with long-term exposure to noise has destroyed marriages, cost people their jobs and forced other people to sell their houses at significant losses (RNTAC, 1991-2003).

While most enforcement officers may have no jurisdiction over noise sources such as aircraft, road noise and railroads, we can still improve the quality of life for complainants who are exposed to a whole range of noise sources. It is equally as important to educate the regulated community as to what their legal responsibilities are. Once it has been demonstrated that a noise source is not in compliance with the applicable ordinance, there exists significant leverage to gain compliance.

The course 'Community Noise Enforcement', and this manual by the same name, have been designed to aid enforcement officers, the regulated community and noise consultants to gain a clear understanding of applicable noise ordinances, and the requirements for their proper enforcement. They are both geared towards real-world enforcement situations, and the possible tactics that might be used to challenge the validity of an enforcement action. Attention to detail is vital.

An appendix on the health effects of noise has been included so that all involved with this effort may have immediate access to part of the important body of literature on noise impacts. Used properly, these facts can be very powerful.

The course and the manual are the collective efforts of the staff of the Rutgers Noise Technical Assistance Center, and reflect a long-standing partnership with the New Jersey Department of Environmental Protection. The certification conferred by this course is required of all enforcement officers in the State of New Jersey, and is also recognized in jurisdictions across the entire United States.

We sincerely appreciate this opportunity to assist you in bringing a better quality of life to your residents.

Eric M. Zwierling, Editor

Breier, A., A. Margot, D. Pickar, et al 1987. Controllable and Uncontrollable Stress in Humans Alterations in Mood and Neuroendocrine and Psychophysiological Function. *Am. J Psychiatry* 144.1419-1425.

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Suter, A. 1992. Noise Sources and Effects *Sound and Vibration* V 26 Jan , 18-38

## ASSORTED NOISE IMPACTS

NOISE PRODUCES ELEVATED BLOOD PRESSURE, FASTER HEART RATES  
AND INCREASED NEUROENDOCRINE HORMONE LEVELS  
THE 'LEARNED HELPLESSNESS' SYNDROME

NOISE CAN CAUSE REGULAR AND PREDICTABLE STRESS ON THE HUMAN BODY

NOISE IS USED BY THE PHARMACEUTICAL INDUSTRY  
TO INDUCE STRESS FOR DRUG TRIALS

PEOPLE DO NOT GET USED TO NOISE - THE BODY CONTINUES TO REACT

NOISE EFFECTS THE QUANTITY AND QUALITY OF SLEEP

WHEN SLEEP IS DISTURBED, WORK EFFICIENCY AND HEALTH MAY SUFFER

NOISE MAY AGGRAVATE EXISTING DISEASE

THE SICK AND ELDERLY ARE MORE SENSITIVE TO DISRUPTIVE NOISE

THE FETUS IS NOT FULLY PROTECTED FROM NOISE

NOISE DISRUPTS THE EDUCATIONAL PROCESS  
& HINDERS LANGUAGE DEVELOPMENT

NOISE CAN OBSCURE WARNING SIGNALS, CAUSING ACCIDENTS TO HAPPEN

NOISE INTERFERES WITH CONVERSATION AND SOCIAL INTERACTION

NOISE DISRUPTS THE PEACEABLE ENJOYMENT OF ONE'S PRIVATE PROPERTY

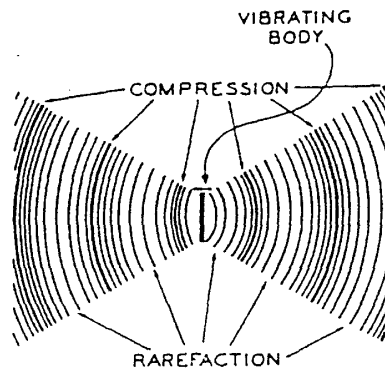
NOISE CAN CAUSE EXTREME EMOTIONS AND BEHAVIOR

ANTI-SOCIAL BEHAVIOR CAUSED BY NOISE  
MAY BE MORE PREVALENT THAN IS REALIZED

*THERE ARE DOCUMENTED CASES OF NOISE-INDUCED  
ARSON - ASSAULT - MURDER - SUICIDE*

# SOUND

Sound waves are a series of compressions and rarefactions within a medium



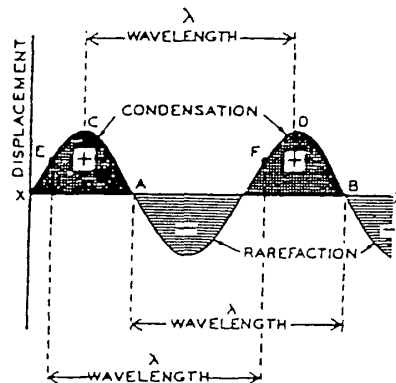
Propagation of a sound wave due to a vibrating body

# NOISE

Occurs when these sound waves reach a sensitized receptor



# PROPERTIES OF SOUND



Displacement-time graph of a sound wave

## INTENSITY

The bigger the compression,  
the larger the amplitude,  
the more the energy,  
the 'louder' it is.

dB- Decibel

The unit of measure and reporting

The decibel scale is logarithmic,  
3 dB = a doubling of intensity.

However,

10 dB = a doubling of perceived loudness  
(6 dB at the lowest frequencies).

$$\text{SPL (dB)} = 20 \log_{10} \frac{P_{\text{Measured}}}{P_{\text{Reference}}}$$

The average threshold of human perception  
is 20 micropascals ( $\mu\text{Pa}$ ) or 0.0002 microbar  
-this is set as the reference number-

Therefore,

0 (zero) decibels is the average threshold of human hearing,  
not the absence of sound pressure.

0 dB threshold of hearing - - - 130,140 dB threshold of pain

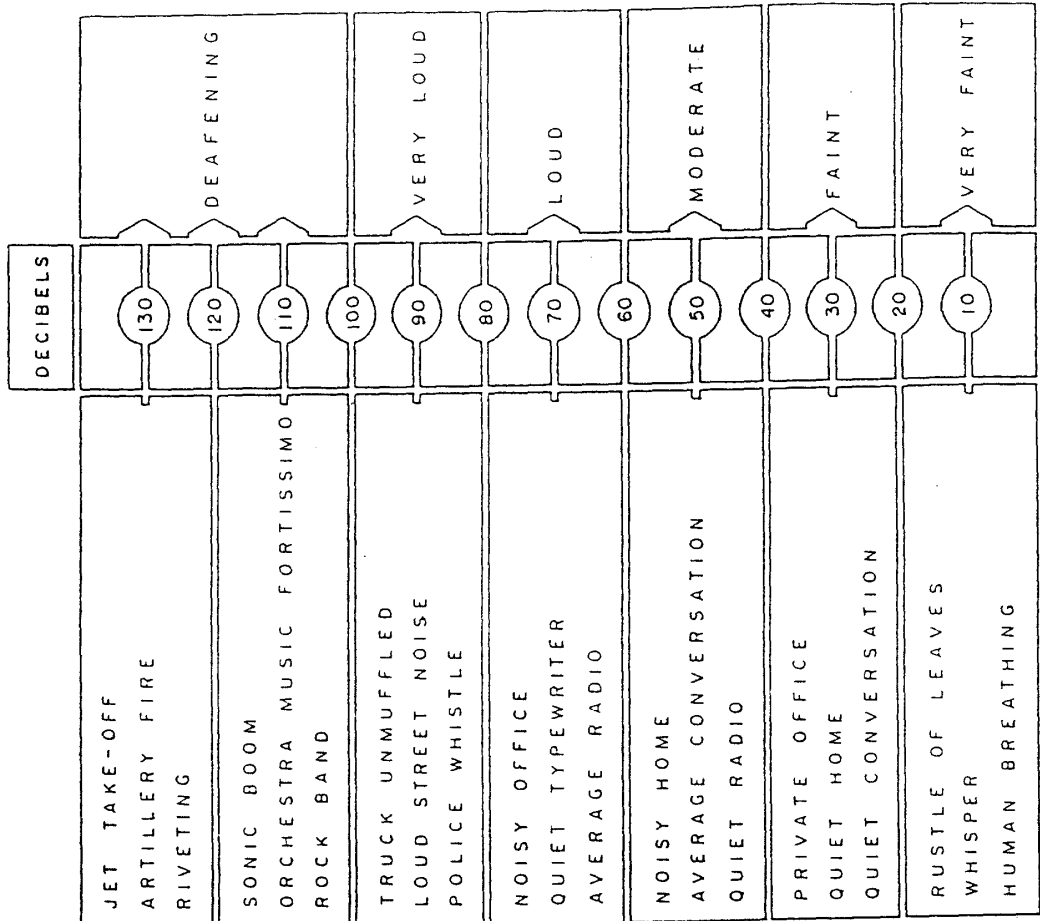


Fig. 3-5 Sound pressure levels of representative sounds and noises.

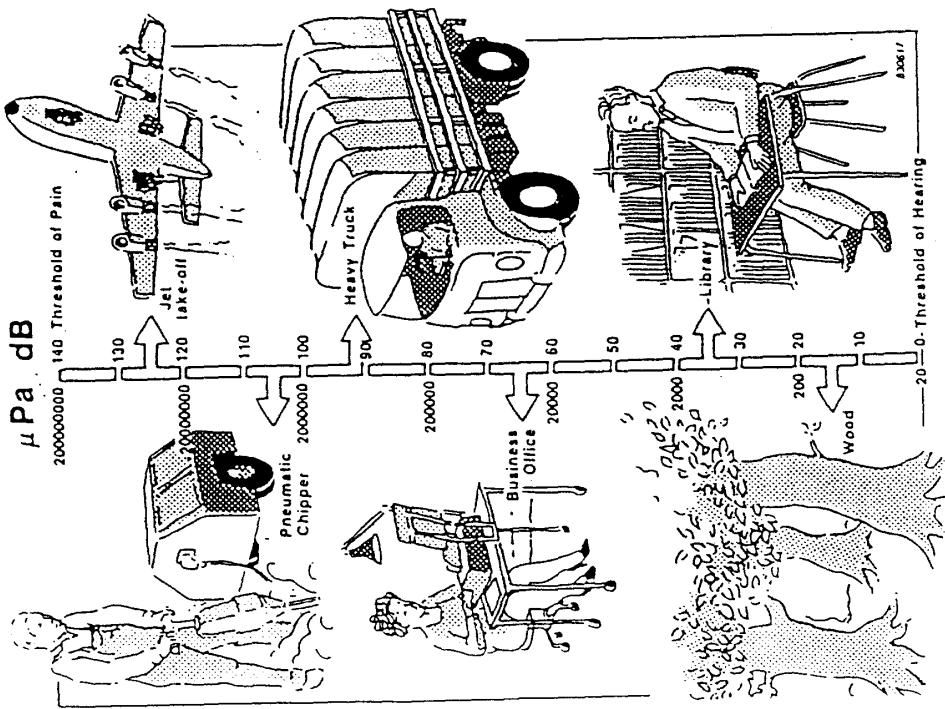
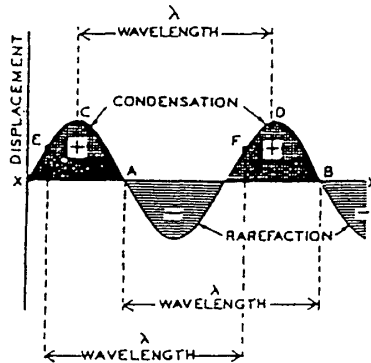


Fig. 5-3. Examples of some typical sound levels, expressed in micropascals on the left side of the scale and decibels on the right. (from Bruel & Kjaer, 1984, reproduced with permission.)

# PROPERTIES OF SOUND



Displacement-time graph of a sound wave

## FREQUENCY (PITCH)

Unit of measure

Hertz (Hz) - cycles per second

Range of human hearing

20 - 20,000 Hz

Humans perceive different frequencies as having different loudness, even though the intensity may be the same.

The A-scale (dBA) is a weighting system which approximates human perception to sounds of moderate intensity.

Humans are most sensitive to 1000-4000 Hz

Humans are relatively insensitive to low intensity sounds of low frequency, but are much more sensitive to high intensity sounds of low frequency.

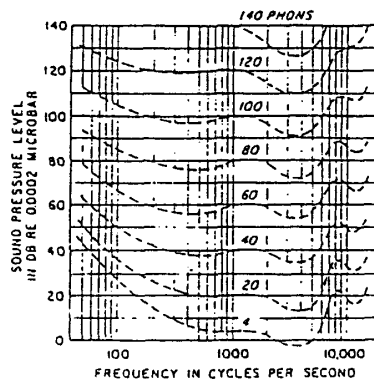
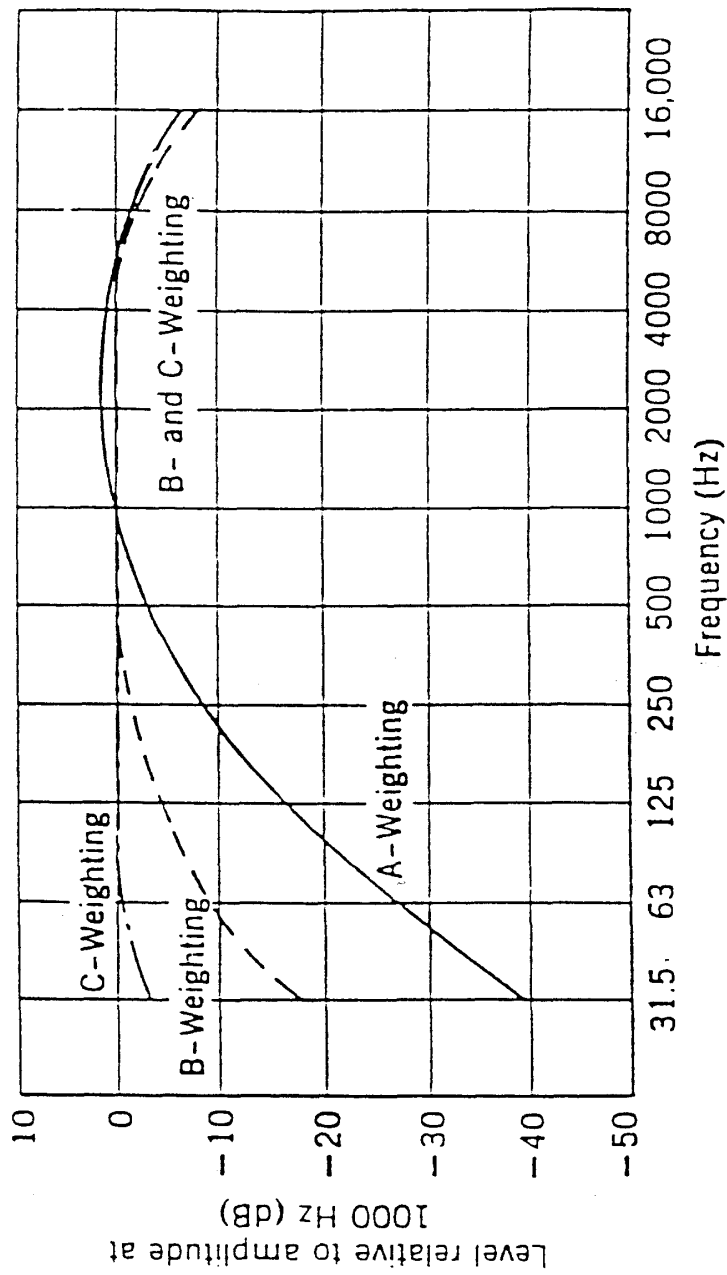


FIG. 5.1. Equal-loudness-level contours. (Robinson and Daddes, 1956)

## Psychological and Sociological Interpretation of Sound



**FIGURE 3-1**  
Internationally standardized A-, B- and C-weighting curves.

From:  
Environmental Noise Control  
Edward Magrab  
John Wiley and Sons  
1975

A - WEIGHTING FREQUENCY ADJUSTMENTS

<u>CENTER FREQUENCY Hz</u>	<u>CORRECTION, dB</u>
31	- 39.4
63	- 26.2
125	- 16.1
250	- 8.6
500	- 3.2
1,000	0.0
2,000	+ 1.2
4,000	+ 1.0
8,000	+ 1.1



## METER AND WEATHER REQUIREMENTS

### A. General Instrumentation Requirements:

1. Sound Level Meter
  - Must meet the specifications of ANSI S1.4-1983 or its successor
  - Type II (General Purpose) or Type I (Precision)
2. Sound Level Calibrator
  - Must meet the recommendation of the sound level meter manufacturer
3. Windscreen
  - Must meet the recommendation of the sound level meter manufacturer
  - May be spherical or cylindrical
  - Made of foamed polyvinyl, open-celled polyurethane or silk covered grid.
  - Should not distort microphone frequency response by more than:
    - +/- 1.0 dBA Frequency: 20-4,000 Hz
    - +/- 1.5 dBA Frequency: 4,000-10,000 Hz
4. Wind Speed Indicator
  - Pressure tube or rotating vane anemometer
  - Manufacturer must provide accuracy rating in MPH or percent

### B. Weather Conditions:

1. Wind:
  - Always use windscreen. A sound level meter can misread wind pressure as sound pressure and affect readings by 40-50 dBA.



- Do not take sound level measurements when the windspeed exceeds the manufacturer's recommendations for the meter and the specific windscreen employed. Generally, the limit is 12 MPH. Some manufacturers offer windscreens that can be used up to 25 MPH.

12 MPH

2. Temperature:

- At high temperatures the sensitivity of the meter can be permanently altered.
- Low temperatures affect batteries and other electrical components
- The meter should be calibrated when its internal temperature is close to the ambient temperature at which it will be used.

3. Humidity:

- Most sound level meters can be operated up to 90% relative humidity.
- Condensation can cause arcing which results in false readings.

4. Precipitation.

- Instruments are not waterproof. Waterproof housings are available for some units from the manufacturer for the meter and the microphone.
- Do not use the meter beyond the environmental parameters recommended by the manufacturer (fog, rain, snow). If these parameters are met, readings may be taken while protecting the meter and the microphone. All readings must be taken in a similar manner.
- Wet pavement can cause higher sound level readings (tires, etc.).

5. Electromagnetic Fields:

- Do not take readings near electrical transformers, radio or television transmission towers, or power lines, unless the manufacturer states that the meter is properly shielded. All of these can contribute to internal electrical noise of the sound level meter.

**KNOW YOUR METER.**

***READ YOUR MANUAL.***

**ALWAYS ASSUME THAT COUNSEL FOR THE DEFENSE HAS.**

1. **Is a warm-up period required for the meter and the calibrator?**
  - Newer meters usually require only a five second warm-up.
  
2. **What scale must you employ for calibration?**
  - Newer meters generally specify calibration on the A-scale.
  
3. **At what angle should you hold the microphone with relationship to the sound source?**
  - The angle is specific to the microphone, and some meters can be supplied with a range of microphones.
  
4. **What is the stated accuracy of your meter?**
  - ANSI S1.4-1983 specifies that a Type I meter should have an accuracy of +/- 1 dB or better, and a Type II meter should have an accuracy of +/-2 dB or better.
  - Newer meters often exceed ANSI standards.
  - Know that in court it may be assumed that the meter is reading high, at the maximum of the accuracy range. Take this into consideration when determining whether to proceed to prosecution.

CALCULATING SOURCE SOUND LEVELS  
FROM BACKGROUND AND TOTAL MEASUREMENTS  
-or- *SUBTRACTION OF SOUND LEVELS*

When you're in the field, you take two types of measurements: *background* and *total*. From these measurements you have to *calculate* the source sound level. The potential violation is based solely on the level of noise being emitted from a specific activity; you can't fine someone because they're operating in a noisy neighborhood. Yet, you can't directly measure the sound level from the activity in question. That's why you have to subtract the background from the total to determine the source sound level.

Here's how it's done: *noise report form*

1. Subtract the background level from the total noise level. (total - background = "X").
2. Using Table I, find "X" in the left hand column.
3. Match "X" to a number in the right hand column.
4. Subtract the number in the right hand column from the total noise level.
5. The number you now have is called the *CORRECTED (SOURCE) LEVEL*, and this is the number that you record on the Noise Report Form.

**Example A**

1. You have a total noise level of 69 dBA, and a background level of 63 dBA.
2.  $69 \text{ dBA} - 63 \text{ dBA} = 6 \text{ dB}$ . This is "X", the number you look for in Table II, left column.
3. 6dB in the left column gives you 1.2 dB in the right column.
4. Subtract 1.2 dB from the TOTAL SOUND LEVEL to get the CORRECTED SOURCE SOUND LEVEL.

$$69 \text{ dBA} - 1.2 \text{ dB} = 67.8 \text{ dBA} \quad \text{**the CORRECTED SOURCE LEVEL**}$$

**Example B**

1. After measuring the background sound level decide which sample set or range you want to use as your background. Usually, a source-off measurement is used if possible.

Example:     52 - 56 dBA  
               51 - 55 dBA  
               54 - 57 dBA   **CHOOSE THIS ONE**

Now, remember - you must use the higher number in a background set, so the number that you'll use for all further calculations is 57 dBA

BACKGROUND = 57 dBA  
(continued)

2. You will have a series of total sound measurements taken while the sound source is on, at one or more locations (say, at the complainant's property, and possibly a residential property that is closer to the sound source). Let's say one set of readings gives you a total range of 64 - 68 dBA, you have to use the lower number for further calculations.

$$\text{TOTAL} = 64 \text{ dBA}$$

3. Perform the subtraction:  $64 \text{ dBA} - 57 \text{ dBA} = 7 \text{ dB}$ . Look at Table II, and you'll see that 7 dBA in the left column gives you 1 dBA in the right column.

64 dBA - 1 dBA = 63 dBA THIS IS THE CORRECTED SOURCE LEVEL

Example C:	Background	59 - 62 dBA		
		61 - <u>64</u>		
		60 - 63		
	Total	69 - 74 dBA	Looking for "X"	Corrected Source
		71 - 77	$69 - 64 = 5$	$69 - 1.6 = 67.4 \text{ dBA}$
		77 - 78	$71 - 64 = 7$	$71 - 1.0 = 70.0 \text{ dBA}$
		66 - 72	$77 - 64 = 13$	77 dBA
			$66 - 64 = 2$	U.E. (Unenforceable)

**IMPORTANT NOTES:**

- 1) If "X" is 10 dB or greater, THEN NO CORRECTION IS NECESSARY.  
TOTAL = SOURCE.
- 2) If "X" is 3 dB or less, *you cannot correct*, and you may write "U.E." (unenforceable), or "--", or simply leave it blank. *Do not* write a corrected number as that would be *in error*.
- 3) *Do not include* your calculations to find "X" on your report form.  
*Do include* any calculations, if necessary, for arriving at the corrected source.

**SEE SAMPLE REPORT FORM**

ADDITION OF SOUND LEVELS  
SEE APPENDIX



TABLE I

DETERMINATION OF THE SOURCE SOUND LEVEL FROM THE TOTAL AND BACKGROUND SOUND LEVEL (DECIBEL SUBTRACTION)

(Pursuant to N.J.A.C. 7:29-2.10 Calculations)

Difference Between Total and Background Levels, dB (Total - Background)		Subtract This Value From the Total Level To Obtain the Corrected Source Level, dB
*(0.5)	Generally regarded as unenforceable. Write "UE" or "----"	9.6
*(1.0)		7.0
*(2.0)		4.0
*(3.0)		3.0
4.0	Do the Math	1.8
5.0		1.6
6.0		1.2
7.0		1.0
8.0		0.75
9.0		0.60
10.0	Source = Total. Report Total Sound Level as the Corrected Source Sound Level	0.50
>10		

DECIBEL SUBTRACTION WITH A SCIENTIFIC CALCULATOR

Corrected source level (dB) = 10 log (10^(total sound level/10) - 10^(neighborhood residual/10))

EXAMPLE

Total sound level = 73 dBA, Neighborhood residual = 67 dBA calculator keystrokes: 10 (y^x) 7.3 - 10 (y^x) 6.7 = (log) x 10 = (answer 71.7)

dbsubtr.sam, c:nzmanual 7/1/02

# CALCULATING SOURCE SOUND LEVELS

Table 1 Correction for Background Levels in Decibels

与表1对照

Difference Between Total and Background Sound Levels (in dBA)	Correction Factor to Be Subtracted From Total Level for Source Level
0-2	Source < Background, therefor unenforceable
3	3
4,5	2
6-9	1
10 or more	0

→ 与表1对照

Adapted from:

Handbook of Environmental Acoustics  
 James P. Cowan, 1994  
 Van Nostrand Reinhold, New York  
 ISBN 0-442-01644-1

nzmahc.sam 7/7/98

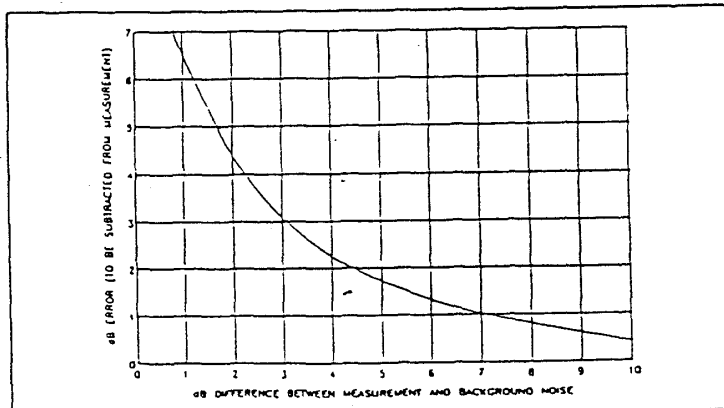


Figure 3 Effects of Background Noise

## instructions for

Models  
 1400 and  
 2400

Sound Level Meter



59-355  
 Rev. D  
 5/97

## PROCEDURE FOR THE COMPLETION OF A NOISE MEASUREMENT REPORT

1. Survey the site on foot to confirm that the suspected source is the actual source (a walk-around), and to determine the best locations from which to measure neighborhood residual and background sound levels. If the suspected source is proven to be the source, draw a map of the site on the back of the report form, including the path of the walk-around, the source and the exact points of measurement.
2. Record the name and address of the property from which the sound is being emitted, including street number if possible. If the source is not a fixed property, attempt to describe it with identifying characteristics, such as license plate number, and vehicle make and model.
3. Fill in day and date of measurement
4. Fill in your name and agency
5. List the name and title of any responsible party who has been notified of the investigation. Attempt to notify a representative of the management of the facility.
6. Describe the noise sources under investigation, including the location of the noise source, the operation of the facility or noise source, the duty cycle if any, and if this measurement represents the normal operation of the noise source.
7. Describe any neighborhood residual (background) sounds which are fairly constant, including their location. Once you have categorized a specific sound as being background you must be careful to include it in all of your measurements (see #12).
8. Describe any extraneous sounds which are intermittent, intense and of short duration. These sounds are noted but are specifically excluded or ignored when taking either total or background sound level measurements.
9. Provide a description of the sound level measurement equipment being used including manufacturer, model number, serial number, and the date of last calibration.
10. Conduct and report the times of field calibration and battery checks, which must be before, after and every hour. The proper procedure for a field calibration check is found at N.J.A.C. 7:29-2.9(a).
11. Report whether there was precipitation or if the ground is wet. Measure and report wind velocity before, after and every hour.
12. Measure and report neighborhood residual sound levels. Neighborhood residual may be measured by one of the following methods:
  - Source off - the preferred method
  - Walk away
  - Behind barrier
  - Similar neighborhood

*continued*



*Procedures - continued*

Neighborhood residual is measured as follows:

Ambient sound level measurements shall be conducted while the source under investigating is not operating, at the same location at which source sound level measurements are made. If this is not possible, ambient sound level measurements may be taken at an alternative location which should be as close as feasible to the location where the source sound levels are measured, but so located that the sound from the source has as little effect on the ambient sound level measurements as possible. The primary source of ambient sound must be equidistant to the location of the source sound level measurements and any alternate location for ambient sound level measurements. Any ambient sound level measurements must be made prior to or following any set of source sound level measurements.

- Record starting time
  - Take a sound level measurement using one of the above methods
  - Note which background measurement method was used.
  - Record the reading range for the measurement, reporting the high and low numbers (ex. 49-52 dBA).
  - Note the location of the measurement and any relevant comments.
  - Record finish time.
  - Determine which neighborhood residual measurement is to be used for the purposes of correction based on the following criteria.
    - Source off is always to be used, if it is available. Use the highest source off, being careful to exclude measurements that may include extraneous sounds.
    - All other background measurement methods are equivalent, and the highest is used, again, excluding any that may contain extraneous sounds.
  - Circle the background number used for correction purposes on the form.
13. Measure and report the Total Noise levels.
- Record starting time.
  - Make certain that you are measuring sound levels that represent the normal and usual operations of the source under investigation. Do not include accidental impacts or the like. Be fair.
  - Take a sound level measurement at several locations surrounding the noise source, making sure that you are at or within the property line of any effected person. If you are enforcing a local ordinance you may be able to take measurements in a public space or a public right of way.
  - Record the reading range for the measurement, reporting the high and low numbers (ex. 67-72 dBA).
  - Note the location of the measurement and any relevant comments.
  - Record finish time.
  - At each location, subtract (using the decibel subtraction technique) the maximum neighborhood residual level from the minimum total noise level to obtain the corrected (source) level in dBA (or in dB, if in octave bands)
  - This calculated number is the source sound level and should be compared to the permissible limits in the ordinance being enforced, to determine if a violation exists.
15. Record the time you arrived on site, and the time you were finished with the investigation, with total duration
- 15 Sign form
- 16 Submit form for review, approval, and enforcement action if appropriate.

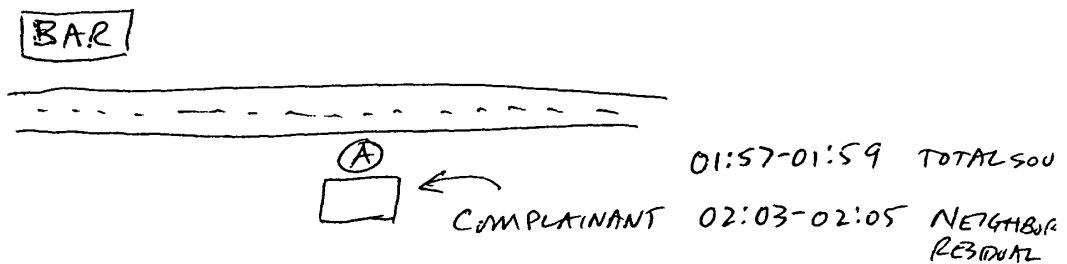
## NEIGHBORHOOD RESIDUAL SOUND LEVELS

### How to Differentiate Between the Bar and the Highway

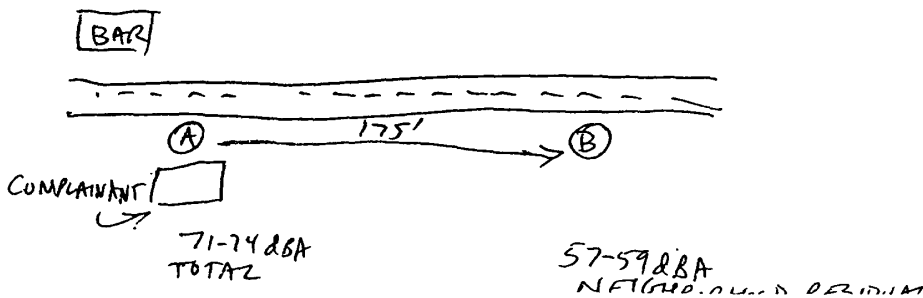
Almost every sound source you will investigate occurs within a complex acoustical environment. Your goal is to isolate and quantify the sound levels of that sound source, alone. In order to accomplish that, you must accurately assess and measure the neighborhood residual sound level. This is the sound level of all the sound sources that are relatively constant when observed from the location on the complainant's property from which the investigation will be conducted. These sound levels exclude sound from the source under investigation, as well as extraneous sounds which are relatively intense and of short duration (such as airplanes, unmuffled vehicles, etc.).

While taking your measurements, you have to note which sounds constitute the neighborhood residual, and which are to be classified as extraneous. Remember, the only neighborhood residual sounds that matter are those impacting on the precise location at which you are measuring the source sound level (total sound). It doesn't matter whether there's an active cement plant three blocks over if you can't hear it on the complainant's property.

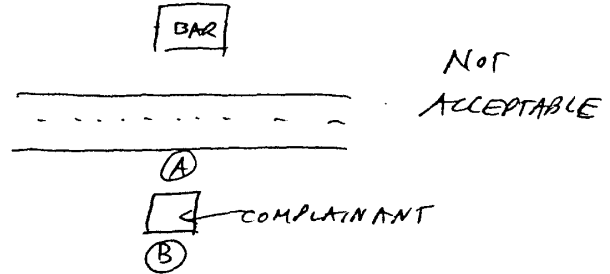
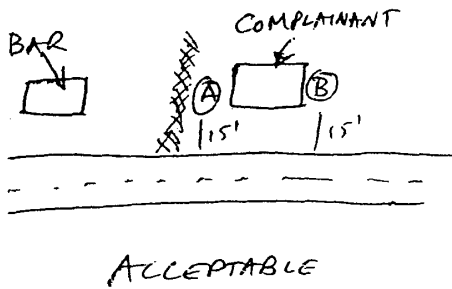
**Source Off** measurements are obviously the truest measure of the sound levels of the neighborhood residual. This approach is simple: you take a measurement of the sound levels when the subject sound source is not operating, at the same location on the complainant's property at which the total sound measurements were taken.



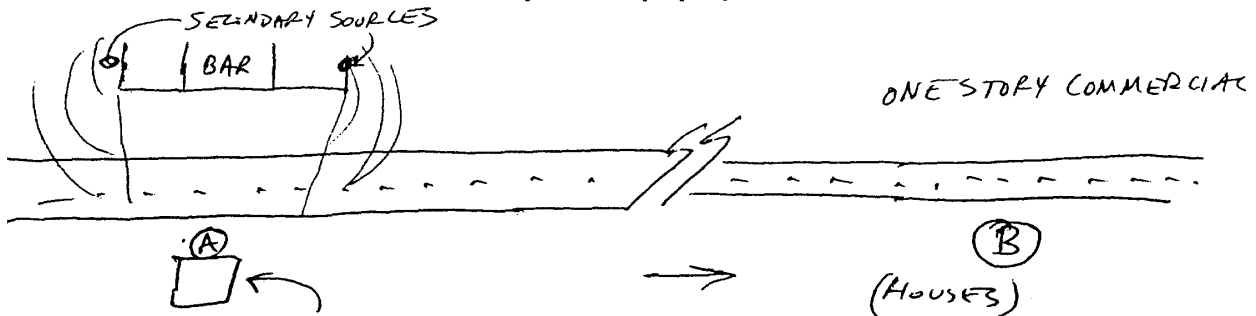
**Walk Away** measurements work if the subject sound source is a point source (a bar, factory, etc.), and there are no other point sources close to the point of measurement. You simply walk along the sidewalk, away from the subject sound source, remaining equidistant to the primary source of neighborhood residual sound. Walk until the sound level drops by 10 dB or more, and you can be certain that all of the Total Sound Level is due to the emissions of the source under investigation. If you walk towards a new sound source, that was not present at the location of the Total Sound Measurements, then these measurements should not be used.



**Behind Barrier** measurements work when the barrier blocks your line of sight to the source under investigation, but not to the primary source of neighborhood residual sound.



**Similar Neighborhood** measurements may be taken if all other methods are unsuccessful. You must make sure that you remain equidistant from the primary source of neighborhood residual sound (such as two blocks from a major road), and in an area where the makeup of the buildings is the same as in the location at the complainant's property.



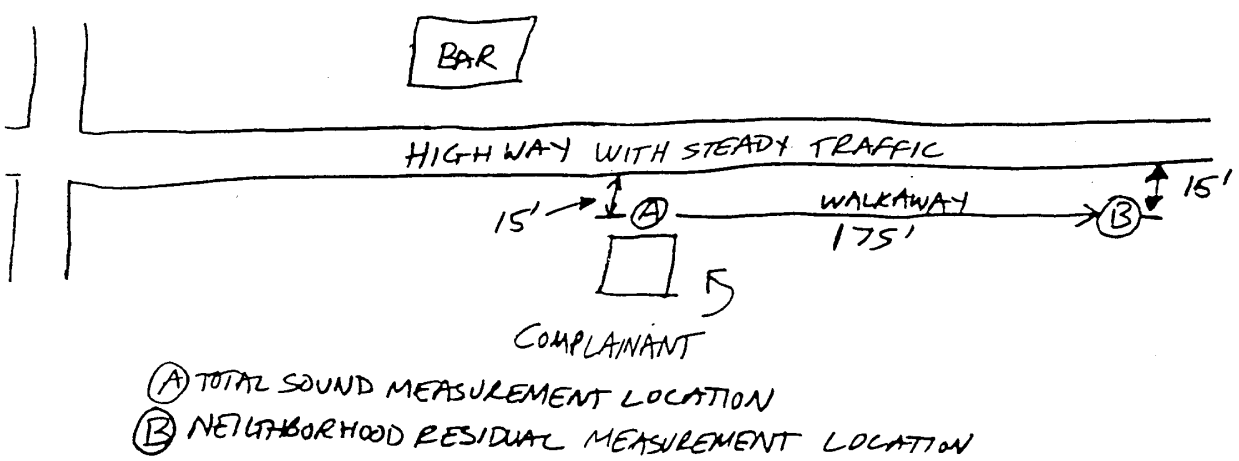
- COMPLAINANT
- 1) NO SOURCE OF OPPORTUNITIES
  - 2) WALK AWAY WONT WORK
  - 3) NO USABLE BARRIERS

**REMEMBER** - accurate measurement of the neighborhood residual sound level is absolutely critical in the accurate assessment of the sound levels emanating from the sound source under investigation

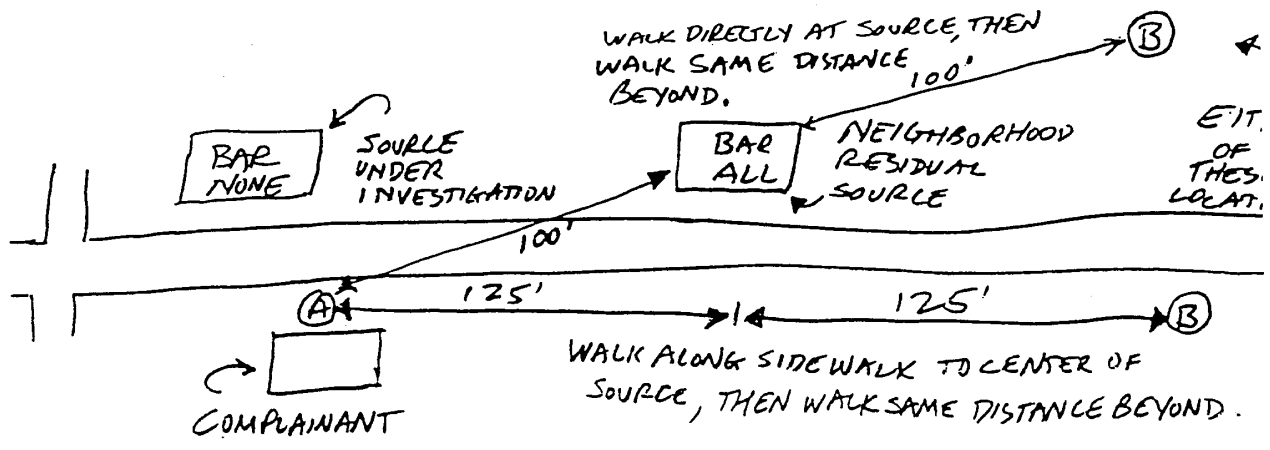
## NEIGHBORHOOD RESIDUAL SOUND LEVEL MEASUREMENT LOCATIONS

Must be equidistant to the primary source of Neighborhood Residual  
when compared to the location at which the Total Sound Levels were measured

### -- A LINE SOURCE --



### -- A POINT SOURCE --





State of New Jersey

DEPARTMENT OF ENVIRONMENTAL  
PROTECTION AND ENERGY

CHRISTINE TODD WHITMAN  
Governor

ROBERT C. SHINN, JR.  
Commissioner

M E M O R A N D U M

To: Eric Zwerling, Rutgers Noise Techn. Assistance Center  
From: Debbie Pinto *DP*  
Office of Local Environmental Management  
Date: March 13, 1995  
RE: Noise Measurement Report Form

The revised Noise Measurement Report submitted by you to my office has been reviewed. The report form is comprehensive and appropriately reflects the requirements found in the State's Noise Control Regulations, N.J.A.C. 7:29-2 et seq. It is therefore acceptable for use by local governmental agencies for the purpose of conducting noise control investigations.

I have attached a copy of the draft noise report form prepared by Theresa Bottini of my staff which includes the same information as the form you developed. The form prepared by DEP will be included in the guidance document on local noise enforcement. Please let me know if you have any comments on this form.

Thank you for your assistance.

Attachment

c. Theresa Bottini

# NOISE MEASUREMENT REPORT

Name/Address of Sound Source: \_\_\_\_\_ Date of Measurement \_\_\_\_\_ Day of Week \_\_\_\_\_  
 \_\_\_\_\_ Investigating Agent, Agency: \_\_\_\_\_  
 \_\_\_\_\_ Name and Title of Responsible Party if Advised of Complaint: \_\_\_\_\_

Description and Location of Sound Sources to be Measured, Including Operation of Facility, Duty Cycle of Sound Source, and if This Represents the Normal Operation of the Facility:  
 \_\_\_\_\_  
 \_\_\_\_\_

Description and Location of Neighborhood Residual Sounds, Fairly Constant in Nature:  
 \_\_\_\_\_

Description and Location of Extraneous Sounds, Intermittent in Nature and Not from Source Facility:  
 \_\_\_\_\_

Description of Instrumentation:	Make, Model#, ANSI Type	Serial #	Last Certified
Sound Level Meter _____			
Microphone (on precision meters) _____			
Sound Level Calibrator _____			
Wind Screen (yes/no) _____	Windmeter (y/n) _____	Other _____	
Time of Calibration/Battery Checks (Before, After, Every Hour) _____			
Weather Conditions: Precipitation (y/n) _____ Ground Wet (y/n) _____			
Temperature: _____ °F			
Wind Velocity, With Time Taken (Before, After, Every Hour) _____			

**Measurement of Neighborhood Residual Sound:**

Time Start/Finish	Reading Range (dBA)	Type of Residual (source off, etc.)	Location of Measurement/Comments
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

**Measurement of Total Sound:**

Time Start/Finish	Reading Range (dBA)	Corrected (Source) Level	Location /Comments
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

**Findings** \_\_\_\_\_  
 \_\_\_\_\_

Time On Site \_\_\_\_\_ Completion Time \_\_\_\_\_ Total Time On Site \_\_\_\_\_

Sound Measured By: \_\_\_\_\_ Report Reviewed and Approved By (if necessary): \_\_\_\_\_

*INCLUDE SITE SKETCH ON REVERSE* (with source, walkaround, and exact measurement locations)  
nzm.nraa/form lwp 2/19/01



# NOISE MEASUREMENT REPORT

Name/Address of Sound Source: BLOOMIN' IDIOT RADIOS  
1313 PIPPIN AVE  
JUNARDLO NJ

Date of Measurement 2/31/03 Day of Week FRI  
 Investigating Agent, Agency: JOHNNY DEZISEZ, JDH  
 Name and Title of Responsible Party if Advised of Complaint: IMA NUYING, MANAGER

Description and Location of Sound Sources to be Measured, Including Operation of Facility, Duty Cycle of Sound Source, and if This Represents the Normal Operation of the Facility:  
INSTALLING AND TESTING OF CAR SOUND SYSTEMS, IN SIDE YARD OF FACILITY FACING GALA RD.  
COMPLAINANT SAYS NOISE IS IRREGULAR 9-5 M-F

Description and Location of Neighborhood Residual Sounds, Fairly Constant in Nature:  
REFRIGERATION UNIT AT MANCUSO'S, STEADY LIGHT TRAFFIC ON PIPP.  
CRICKETS OFF IN DISTANCE.

Description and Location of Extraneous Sounds, Intermittent in Nature and Not from Source Facility:  
BIRDS, ACTIVITIES IN LIBRARY PARKING LOT, LOUD VEHICLES ON PIPP  
ALL VEHICLES ON GALA RD

Description of Instrumentation:

	Make, Model#, ANSI Type	Serial #	Last Certified
Sound Level Meter	<u>ACME 1142 TYPE II</u>	<u>72745</u>	<u>1/17/03</u>
Microphone (on precision meters)	<u>-NA-</u>		
Sound Level Calibrator	<u>ACME CAL 150</u>	<u>74757</u>	<u>1/17/03</u>
Wind Screen (yes/no)	<u>Y</u>	Windmeter (y/n) <u>Y</u>	Other <u>-</u>
Time of Calibration/Battery Checks (Before, After, Every Hour) <u>11:24 AM</u> <u>11:48 AM</u>			

Weather Conditions: Precipitation (y/n) N Ground Wet (y/n) N Temperature: 47  
 Wind Velocity, With Time Taken (Before, After, Every Hour) <2-6 MPH gusts to 9 11:10  
<2 MPH 11:50

Measurement of Neighborhood Residual Sound:

Time Start/Finish	Reading Range (dBA)	Type of Residual (source off, etc.)	Location of Measurement/Comment
<u>11:39-11:40</u>	<u>59-64</u>	<u>BEHND BARRIER</u>	<u>B</u>
<u>11:40-11:41</u>	<u>60-63</u>	<u>" "</u>	<u>B</u>
<u>11:45-11:46</u>	<u>58 (61)</u>	<u>SOURCE OFF</u>	<u>A</u>

Measurement of Total Sound:

Time Start/Finish	Reading Range (dBA)	Corrected (Source) Level	Location /Comments
<u>11:27-11:28</u>	<u>64-67</u>	<u>-</u>	<u>A</u>
<u>11:28-11:29</u>	<u>65-68</u>	<u>65-1.8=63.2</u>	<u>A</u>
<u>11:29-11:30</u>	<u>67-74</u>	<u>67-1.2=65.8</u>	<u>A</u>
<u>11:30-11:31</u>	<u>66-77</u>	<u>66-1.6=64.4</u>	<u>A</u>
<u>11:32:05-11:32:15</u>	<u>71-77</u>	<u>71</u>	<u>A</u>
<u>11:34-11:35</u>	<u>69-74</u>	<u>69-0.75=68.25</u>	<u>A</u>
<u>11:43-11:44</u>	<u>72-74</u>	<u>72</u>	<u>A</u>
<u>11:44-11:45</u>	<u>73-75</u>	<u>73</u>	<u>A</u>

Findings FACILITY EXCEEDS PERMISSIBLE LIMIT OF 65 dBA.

Time On Site 11:09 Completion Time 11:56 Total Time On Site 47 MINS

Sound Measured By: Johnny Dezisez Report Reviewed and Approved By (if necessary): Big Bossman

INCLUDE SITE SKETCH ON REVERSE (with source, walkaround, and exact measurement locations)



ORCHARD  
OUTLET MALL

JERSEY  
DEVIL  
DOGS

PIPPIN AVENUE

WALK AROUND  
11:15-11:19

BOBMIN IDIOT  
RABIOS  
CARS  
BEING  
TESTED

WOODED  
LOT

BOSS  
BIKES

MANCUSO'S  
MEAT  
MANIA  
MARKET

REFRIGERATION  
UNIT

GALVA RD

PHILLY  
CHEESE  
STEAKS

JANARD  
PUBLIC LIBRARY

RESIDENCE

1122  
GALVA RD

(A)

(B)

## GUIDELINES FOR CONDUCTING AN OCTAVE BAND ANALYSIS INVESTIGATION

1. Initial investigations should be conducted with measurements on the A-scale, to determine if the sound source is exceeding the A-scale permissible limits. Even though it may be apparent that the sound emissions are a steady, pure tone, it is less time consuming to conduct an A-scale investigation. If an A-scale violation can be confirmed, it will be unnecessary to proceed with an octave band analysis investigation.
2. Octave band analysis may be indicated if an A-scale investigation determines that no violation exists, relative to permissible A-scale limits, but the sound levels measured are within 5-10 dBA of these limits.
3. Octave band analysis is only appropriate when the sound emissions from the source under investigation are a steady, pure tone. "When octave band measurements are made, the sound from the source must be constant in level and character" [N.J.A.C. 7:29-2.9(b) 1.i]
4. An initial sweep of the octave bands, with the worksheet in hand, will help you determine if a full scale investigation is warranted. With a little practice you may be able to 'guestimate' the frequency of the sound emissions, and a rapid measurement at that frequency will help you determine if there is cause to proceed.
5. When evaluating these initial results, keep in mind the tolerances that must be subtracted from your final corrected source levels. If no violation exists on the A-scale, the octave band sound pressure levels measured may not exceed the permissible octave band limit more than a few decibels.
6. If the presence of a violation is confirmed, measure and record the sound pressure level for at least 2 time intervals for each frequency at which a violation is confirmed. It is suggested that you record the sound pressure levels for the octave band(s) below and above the octave band(s) at which the violation(s) are confirmed (i.e. bracket these octave bands).
7. Total and Neighborhood Residual measurements must be taken in such a manner that predominant source(s) of background sound are similar in both the locations.
8. **Neighborhood residual measurements must be taken for each octave band at which a violation has been established.** Calculations for the corrected source level must be a correction based upon the appropriate neighborhood residual measurement (i.e. correct each total noise measurement with a background measurement taken at that frequency)
9. If a violation is confirmed, and your agency decides to proceed to enforcement, it is particularly relevant to determine if the violation is minor or major pursuant to N.J.A.C. 7:29-1.6. This determination will dictate your course of actions, as outlined in that section of the code. Most steady pure tones are the result of a mechanical malfunction and are "the result of the purposeful, reckless or criminally negligent conduct of the violator."

NOISE MEASUREMENT REPORT

Name/Address of Noise Source:

Date of Measurement \_\_\_\_\_ Day of Week \_\_\_\_\_

Investigating Agent, Agency:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ COUNTY \_\_\_\_\_

Name and Title of Responsible Party if Advised of Complaint

Description and Location of Noise Sources to be Measured, Including Operation of Facility, Duty Cycle of Noise Source, and if This Represents the Normal Operation of the Facility:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Description and Location of Neighborhood Residual Noises, Fairly Constant in Nature:

\_\_\_\_\_  
\_\_\_\_\_

Description and Location of Extraneous Noises, Intermittent in Nature and Not from Source Facility:

\_\_\_\_\_

Description of Instrumentation:	Model #	Serial #	Last Certified:
Sound Level Meter	_____	_____	_____
Octave Filter Set	_____	_____	_____
Microphone	_____	_____	_____
Sound Level Calibrator	_____	_____	_____
Wind Screen (yes/no)	_____	Windmeter (y/n)	_____ Other _____
Time of Calibration/Battery Checks (Before, After, Every Hour)	_____		
Weather Conditions: Precipitation (y/n)	_____	Ground Wet (y/n)	_____ Temperature: _____
Wind Velocity, With Time Taken (Before, After, Every Hour)	_____		

Measurement of Neighborhood Residual Noise:

Time Start/Finish	Reading Range (dB)	Frequency (Hz)	Type of Residual	Location of Measurement/Comment
-------------------	--------------------	----------------	------------------	---------------------------------

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Measurement of Total Noise:

Time Start/Finish	Reading Range (dB)	Frequency (Hz)	Corrected (Source ) Level	Location of Measurement/Comment
-------------------	--------------------	----------------	---------------------------	---------------------------------

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Time On-Site: Start Time \_\_\_\_\_

Finish Time \_\_\_\_\_ Total Duration \_\_\_\_\_

Noise Measured By: \_\_\_\_\_

Report Reviewed and Approved By (if necessary): \_\_\_\_\_

\_\_\_\_\_

INCLUDE SITE SKETCH ON REVERSE (with source, walkaround, and exact measurement location)



## NOISE MEASUREMENT REPORT

Name/Address of Noise Source: ORCHARDVIEW APTS.  
256 HILLCREST ROAD  
PIPPIN, NJ  
COUNTY SPIGOLD

Date of Measurement 2/32/97 Day of Week TU  
 Investigating Agent, Agency: LUTHER BURBANK, PIPPIN HEALTH DEPT.  
 Name and Title of Responsible Party if Advised of Complai C.A. RUST - APT. MANAGER

Description and Location of Noise Sources to be Measured, Including Operation of Facility, Duty Cycle of N Source, and if This Represents the Normal Operation of the Facility:

HUM OF MALFUNCTIONING FLUORESCENT LIGHTS IN APARTMENT NAME MAR.  
AUDIBLE IN APARTMENTS 4B, 4C, 5B, 5C. LIGHTS OPERATE FROM DI  
TO DAWN AS DICTATED BY PHOTODIODE. STEADY PURE TONE HUM.  
LOWEST IN APARTMENT 4C. SOURCE CONFIRMED BY DIRECT OBSERVATION OUT 4C W.

Description and Location of Neighborhood Residual Noises, Fairly Constant in Nature:

AIR HANDLING EQUIPMENT, TV OR RADIO IN ADJOINING APARTMENTS

Description and Location of Extraneous Noises, Intermittent in Nature and Not from Source Facility:

LOUD FOOT STEPS ABOVE, DOOR SLAMS, TOILET FLUSHES/WATER IN PIPES,

Description of Instrumentation:	Model #	Serial #	Last Certified:
Sound Level Meter	<u>BEK 1267 TYPE I</u>	<u>42759</u>	<u>12/6/96</u>
Octave Filter Set	<u>BEK 220</u>	<u>1159</u>	<u>12/6/96</u>
Microphone	<u>BEK 436A</u>	<u>8852</u>	<u>12/6/96</u>
Sound Level Calibrator	<u>BEK PISTON 32</u>	<u>98999</u>	<u>12/6/96</u>
Wind Screen (yes/no) <u>Y</u>	Windmeter (y/n) <u>N/A</u>	Other	
Time of Calibration/Battery Checks (Before, After, Every Hour) <u>11:16 PM, 11:52</u>			
Weather Conditions: Precipitation (y/n) <u>N/A</u> Ground Wet (y/n) <u>N/A</u> Temperature: <u>72</u>			
Wind Velocity, With Time Taken (Before, After, Every Hour) <u>N/A</u>			

### Measurement of Neighborhood Residual Noise:

Time Start/Finish	Reading Range (dB)	Frequency (Hz)	Type of Residual	Location of Measurement/Corr
<u>11:42-11:43</u>	<u>36-41 dBA</u>			<u>APT 4F Accr</u>
<u>11:43-11:44</u>	<u>38-43 dBA</u>			<u>"</u>
<u>11:44-11:44:30</u>	<u>64-66 dB</u>	<u>31.5</u>		<u>"</u>
<u>11:44:30-11:45</u>	<u>50-53 dB</u>	<u>63</u>		<u>"</u>

### Measurement of Total Noise:

Time Start/Finish	Reading Range (dB)	Frequency (Hz)	Corrected (Source) Level	Location of Measurement/Corr
<u>11:17-11:18</u>	<u>37-43 dBA</u>	<u>---</u>	<u>---</u>	<u>APT 4C</u>
<u>11:18-11:19</u>	<u>38-42 dBA</u>	<u>---</u>	<u>---</u>	<u>APT 4C</u>
<u>11:19-11:20</u>	<u>39-44 dBA</u>	<u>---</u>	<u>---</u>	<u>APT 4C</u>
<u>11:21-11:21:30</u>	<u>62-65 dB</u>	<u>31.5 Hz</u>	<u>---</u>	<u>"</u>
<u>11:21:30-11:22</u>	<u>52-54 dB</u>	<u>63</u>	<u>---</u>	<u>"</u>
<u>11:22-11:22:30</u>	<u>41-43 dB</u>	<u>125</u>	<u>---</u>	<u>"</u>
<u>11:22:30-11:23</u>	<u>47-48 dB</u>	<u>250</u>	<u>47-0.75=46.25</u>	<u>"</u>
<u>11:23-11:24</u>	<u>47 dB</u>	<u>250</u>	<u>47-0.75=46.25</u>	<u>"</u>
<u>11:24-11:25</u>	<u>47-48 dB</u>	<u>250</u>	<u>47-0.75=46.25</u>	<u>"</u>
<u>11:25-11:26</u>	<u>41-43 dB</u>	<u>500</u>	<u>41-0.75=40.25</u>	<u>"</u>

Time On-Site: Start Time 11:15  
 Noise Measured By:

Finish Time 11:53 Total Duration 38 mins  
 Report Reviewed and Approved By (if necessary):

Luther Burbank

NOISE MEASUREMENT REPORT

2/22/97  
ORCHARDVIEW APTS.

Measurement of Neighborhood Residual Noise:

Time Start/Finish	Reading Range (dB)	Frequency (Hz)	Type of Residual	Location of Measurement/Cor
11:45-11:45:30	39-41	125		APT 4F
11:45:30-11:46	38-39	250		"
11:46-11:47	37-39	250		"
11:47-11:48	31-33	500		"
11:48-11:49	31-32	500		"
11:49-11:49:30	30-35	1000		"
11:49:30-11:50	<30-37	2000		"

Measurement of Total Noise:

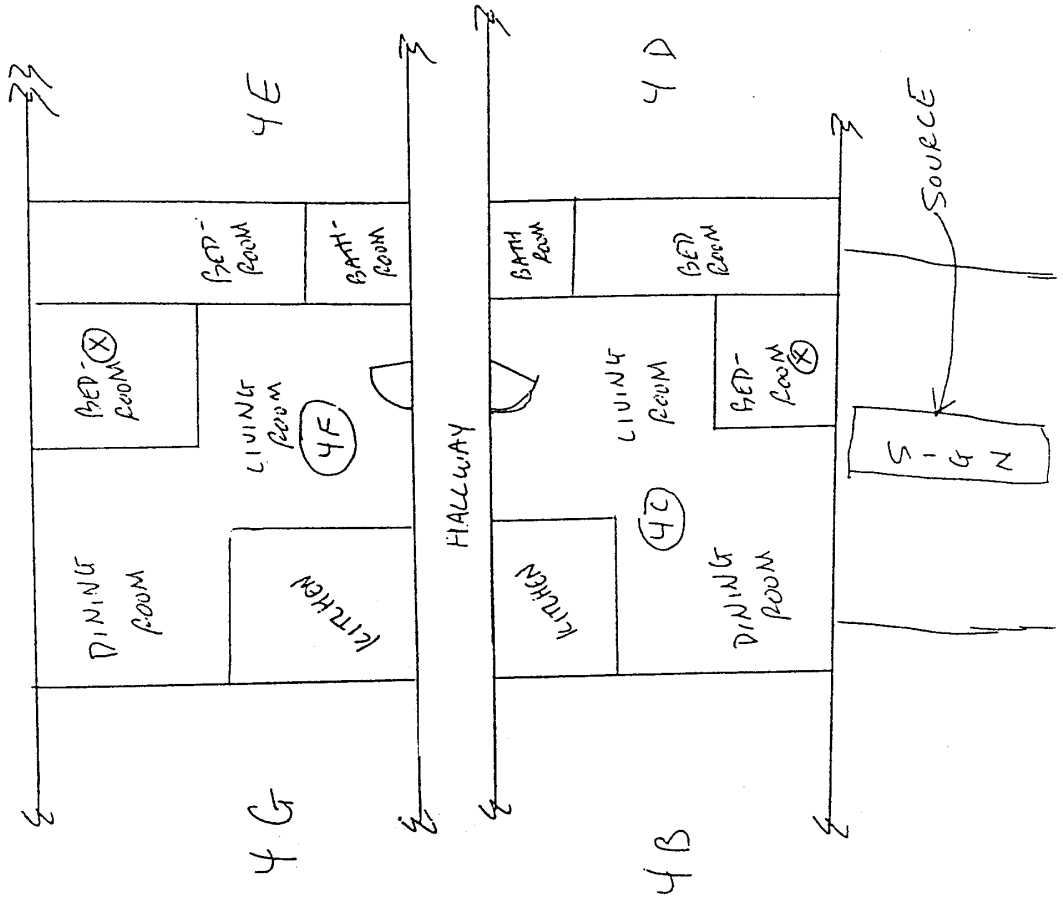
Time Start/Finish	Reading Range (dB)	Frequency (Hz)	Corrected (Source ) Level	Location of Measurement/Cor
11:26-11:27	42-43	500 Hz	42-0.6 = 41.4	APT 4C
11:27-11:27:30	37-44	1000	U.E.	"
11:27:30-11:28	35-43	1000	U.E.	"
11:28-11:28:30	28-39	2000	U.E.	"

2/32/97 ORCHARDVIEW APTS

51

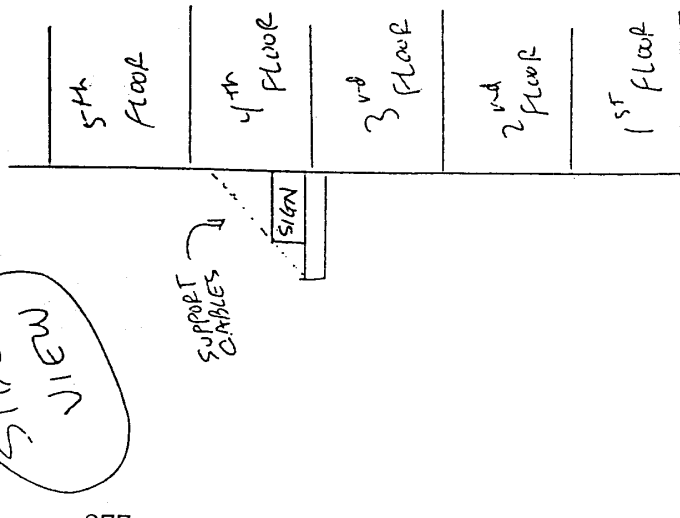
(X) = Measurement Locations

# FLOOR PLAN



# SIDE VIEW

277







## 附件七：美方專家學者名片影本

美國賓州大學區域科學博士  
美國舊金山灣區政府協會資深規劃師



**楊欽明**

電話 (510) 464-7925  
傳真 (510) 433-5525  
電郵 ChinY@abag.ca.gov



**ASSOCIATION OF BAY AREA GOVERNMENTS**  
www.abag.ca.gov

Chin Ming Yang, Ph.D. 510/464-7925  
Principal fax: 510/433-5525  
ChinY@abag.ca.gov

Mail: P.O. Box 2050, Oakland, CA 94604-2050  
MetroCenter, 101 Eighth Street, Oakland, CA 94607-4756

美國加州大學環保科學及工程博士  
美國舊金山灣區政府協會執行長



www.abag.ca.gov

**梁英振**

電話 (510) 464-7910  
傳真 (510) 433-5510  
電郵 EugeneL@abag.ca.gov



**ASSOCIATION OF BAY AREA GOVERNMENTS**  
www.abag.ca.gov

Eugene Y. Leong 510/464-7910  
Executive Director fax: 510/433-5510  
EugeneL@abag.ca.gov

Mail: P.O. Box 2050, Oakland, CA 94604-2050  
MetroCenter, 101 Eighth Street, Oakland, CA 94607-4756

**State of California**



Department of Transportation, District 4  
Office of Environmental Engineering  
Mail Station: 6  
111 Grand Avenue 94612/Mail: P.O. Box 23660  
Oakland, CA 94623-0660

**Glenn Kinoshita**  
District Branch Chief

(510) 286-5677  
Calnet 541-5677  
glenn\_kinoshita@dot.ca.gov

**State of California**



Department of Transportation  
District 4—Environmental Engineering  
111 Grand Ave./Mail: P.O. Box 23660  
Oakland, CA 94623-0660

**Shiang Yang, P.E.**  
Transportation Engineer

(510) 286-5652  
CALNET 541-5652  
FAX 286-5642

**State of California**



Department of Transportation  
District 4—Environmental Engineering Branch  
111 Grand Ave./Mail: P.O. Box 23660  
Oakland, CA 94623-0660

**Chris Corwin**  
Environmental Engineer

(510) 286-5630  
CALNET \_\_\_\_\_

**CITY OF OAKLAND**  
COMMUNITY & ECONOMIC  
DEVELOPMENT AGENCY



**CALVIN N. WONG, P.E.**  
DIRECTOR OF BUILDING SERVICES  
BUILDING OFFICIAL

(510) 238-4794  
FAX 238-6996  
TDD 238-3254

e-mail: cwong@oaklandnet.com

250 FRANK H. OGAWA PLAZA, 2ND FLR., OAKLAND, CA 94612-2031





楊 仁 泰

**Jentai Yang, Ph.D. P.E.**  
**Senior Program Manger**

Office of International Affairs (2650R)  
U.S. Environmental Protection Agency  
1200 Pennsylvania Ave, NW  
Washington DC 20004

Phone: (202) 564-6429  
Fax: (202) 565-2412  
Beijing: 1367 120 8114  
Email: Yang.Jentai@epa.gov



**U.S. ENVIRONMENTAL  
PROTECTION AGENCY**

**Kenneth E. Feith**  
Office of Air and Radiation

Mail Code 6103A  
1200 Pennsylvania Ave., N.W.  
Washington, DC 20460

Telephone: (202) 564-1679  
Fax: (202) 564-1557  
E-mail: feith.ken@epa.gov

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**MARYLAND DEPARTMENT of the ENVIRONMENT**

**STANLEY TSAI**  
ADMINISTRATOR III

ENVIRONMENTAL PERMITS SERVICE CENTER  
stsai@mde.state.md.us

1800 Washington Blvd., Ste. 735 Phone: 410-537-4478  
Baltimore MD 21230-1720 Fax: 410-537-4477

~~www.mde.state.md.us~~

**MARYLAND DEPARTMENT of the ENVIRONMENT**

**GEORGE HARMAN**  
PROGRAM MANAGER

ENVIRONMENTAL ASSESSMENT AND PLANNING  
gharman@mde.state.md.us

1800 Washington Blvd., Ste. 540 Phone: 410-537-3856  
Baltimore MD 21230-1718 Fax: 410-537-3873

~~www.mde.state.md.us~~

MARYLAND DEPARTMENT of the ENVIRONMENT

**DAVE JARINKO**

NOISE CONTROL INSPECTOR  
1-800-633-6101 x3183 FOR NOISE ISSUES  
djarinko@mde.state.md.us

**MDE**

1800 Washington Blvd., Ste. 540 Phone: 410-537-3938  
Baltimore MD 21230-1718 Fax: 410-537-3873



**State Highway Administration**  
Maryland Department of Transportation

**Kenneth D. Polcak**  
Environmental Analyst

Noise Abatement Design and Analysis Team  
Office of Environmental Design

707 N. Calvert Street, Baltimore, MD 21202  
410-545-8601 1-800-446-5962 FAX: 410-209-5003  
e-mail: kpolcak@sha.state.md.us



**CHEIN-CHI CHANG, Ph. D., P.E.**  
Planning and Design

(Phone) (202) 787-2459  
(Fax) (202) 787-2453  
(e-mail) cchang@dcwasa.com

District of Columbia  
Water and Sewer Authority  
Department of Engineering and Technical Services

5000 Overlook Ave., SW • Washington, D.C. 20032



**Sorin Schwartz, CIH**

Industrial Hygienist  
Department of Occupational Safety and Health

Phone: 202-787-4347  
Fax: 202-787-4383

District of Columbia  
Water and Sewer Authority

E-mail: sschwartz@dcwasa.com

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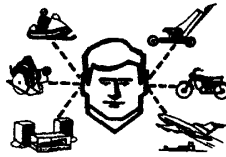
5000 Overlook Avenue, SW -- Washington, D.C. 20032

*Peter Lan*  
Senior Assistant to the Director General  
Taipei Economic & Cultural Office  
in New York

885 Second Avenue,  
47th Floor  
New York, N.Y. 10017

Tel: (212)317-7300  
Fax: (212)754-1549  
E-mail: Pete170\_2000@yahoo.com

THE STATE UNIVERSITY OF NEW JERSEY  
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Eric M. Zwerling, M. S., Director  
Rutgers Noise Technical Assistance Center  
Department of Environmental Sciences  
14 College Farm Road  
New Brunswick, NJ 08901-8551  
Voice: 732/932-8065 Fax: 732/932-8644  
E-mail: Zwerling@envsci.rutgers.edu



**GERALDINE KELPIN**  
Director  
Environmental Compliance

TEL (718) 595-3627  
FAX (718) 595-3744

59-17 Junction Boulevard, 8th Floor, Corona, New York 11368-5107

**BROOKHAVEN**  
NATIONAL LABORATORY

Upton, New York, 11973 USA

*John C. Lee, Ph.D.*

*Program Manager  
Policy Analysis and International Activities  
Energy Sciences and Technology Department  
Tel. 1-631- 3442248 Fax. 1-631 3445730  
e-mail: jcl@bnl.gov*



## 附件八：研習活動照片

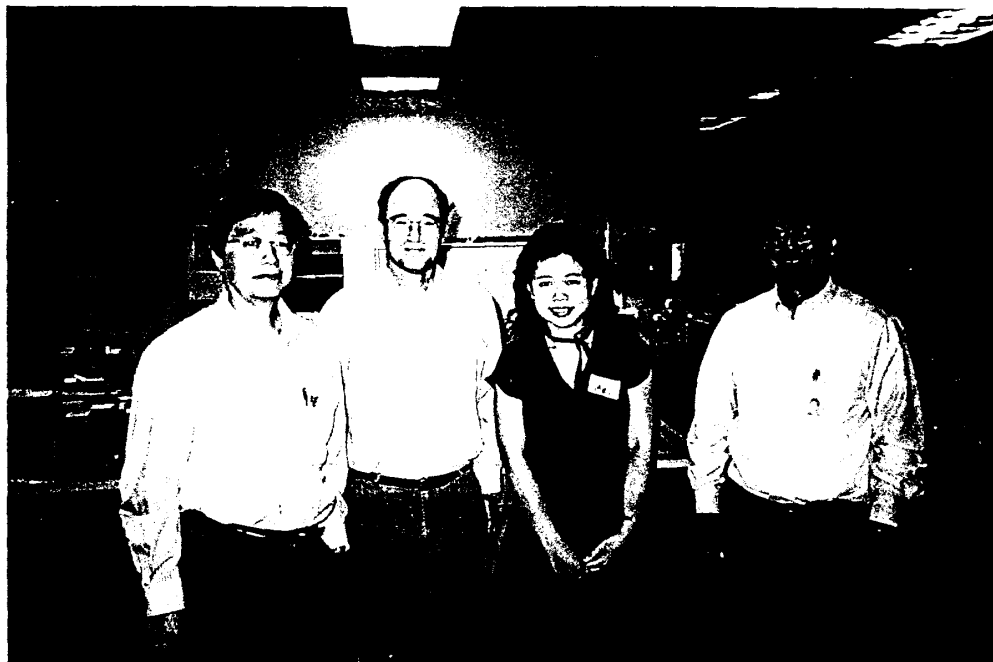




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執行長梁英振博士 (Dr. Eugene Y. Leong )



參訪美國舊金山灣區政府協會 (ABAG) 拜會  
楊欽明博士 (Dr. Chin Ming Yang)



參訪加州運輸部環境工程辦公室拜會  
分局長克諾許塔博士 (Dr. Glenn Kinoshita) 等人



參訪奧克蘭市社區經濟發展局 建築公共服務部  
拜會部長翁卡文 (Calvin N. Wong, P. E)



參訪美國環保署 (USEPA) 拜會國際事務辦公室  
楊仁泰博士 (Dr. Jentai Yang )



參訪美國環保署 (USEPA) 拜會空氣及輻射辦公室  
費斯先生 (Kenneth E. Feith )



參訪馬里蘭州政府環境部 (MDE) 拜會  
蔡史坦立博士 (Dr. Stanley Tsai )



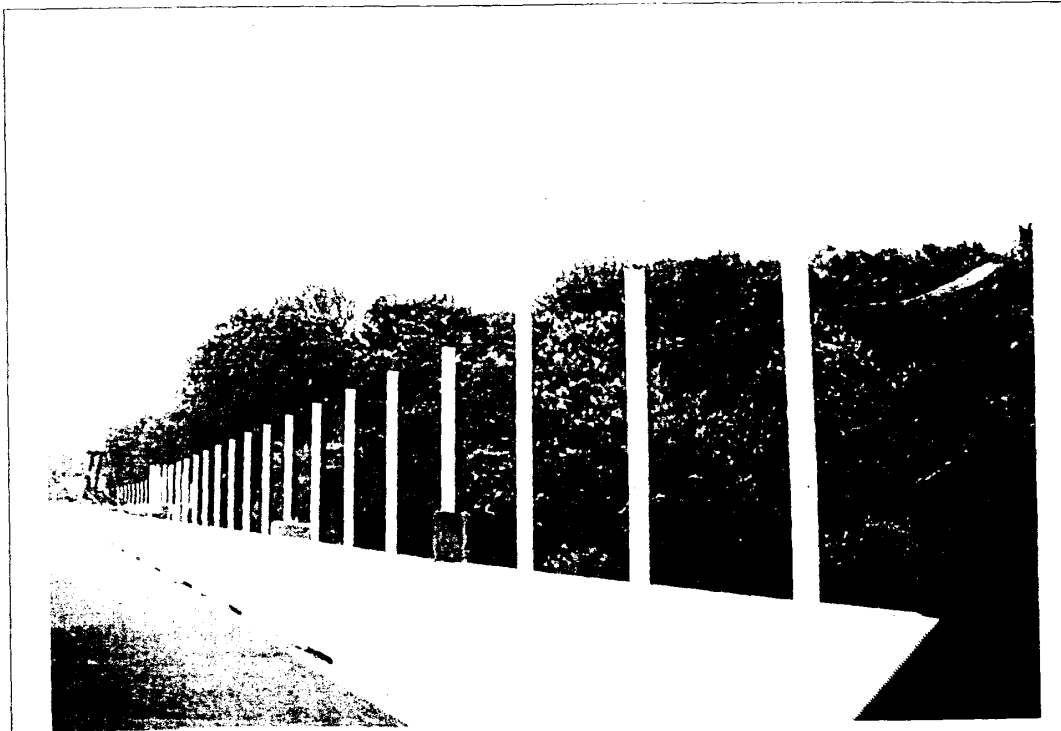
參訪馬里蘭州政府環境部 (MDE) 拜會喬治哈曼先生  
(Mr. George Harman) 及結瑞克戴夫 (Dave Jarinko)



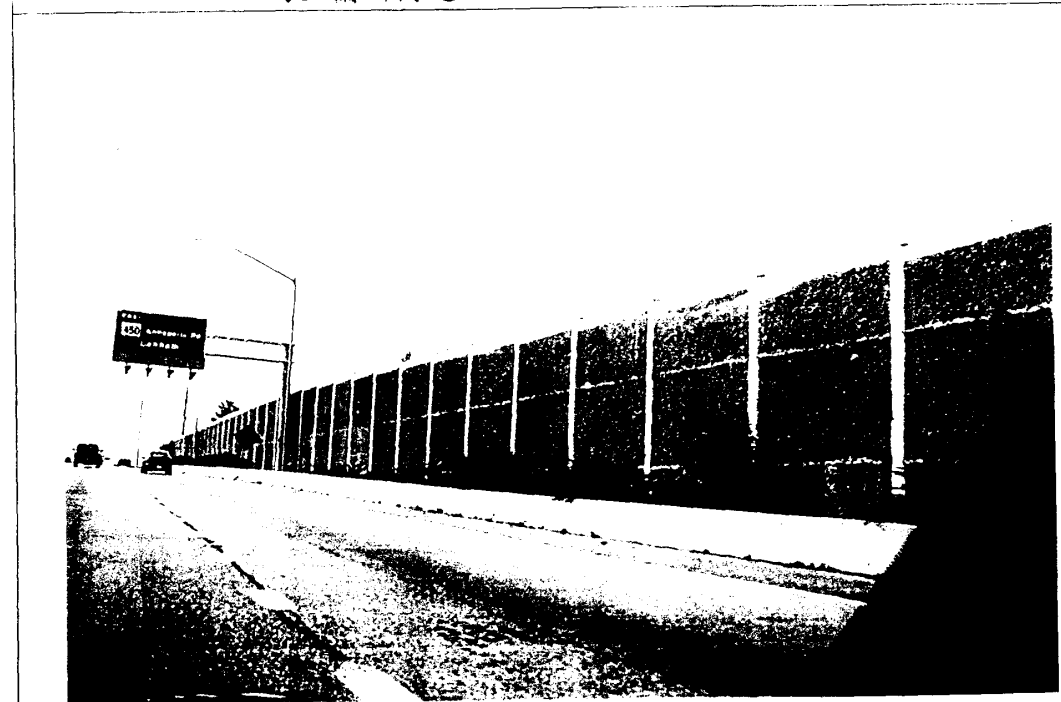
參訪馬里蘭州運輸部州立高速公路局 (SHA) 拜會  
波可克先生 (Mr. Kenneth D. Polcak )



與美國環保署楊仁泰博士、馬里蘭州政府環境部蔡史坦立博士  
等人合影於參馬里蘭州政府環境部



馬里蘭州高速公路隔音牆--1 (構築前)



馬里蘭州高速公路隔音牆--2 (石材)



馬里蘭州高速公路隔音牆--3 (石材加上綠籬)



馬里蘭州高速公路隔音牆--4 (石材加上綠籬及緩衝帶)

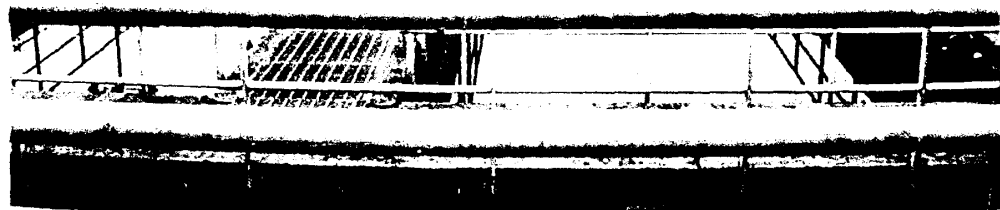
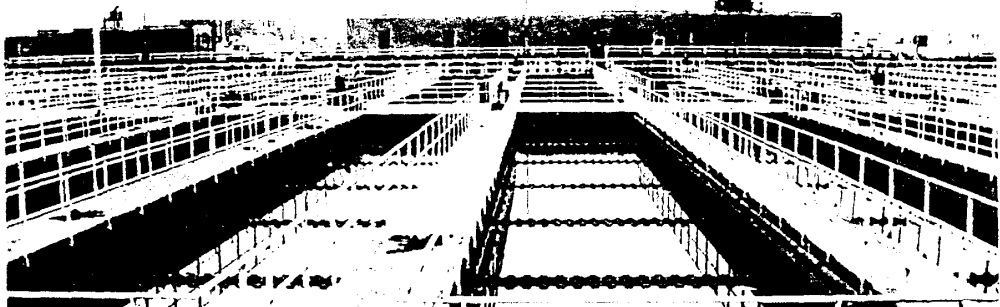


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張清奇博士 (Dr. Chein-Chi , Chang) 及 Mr. Sorin Schwartz





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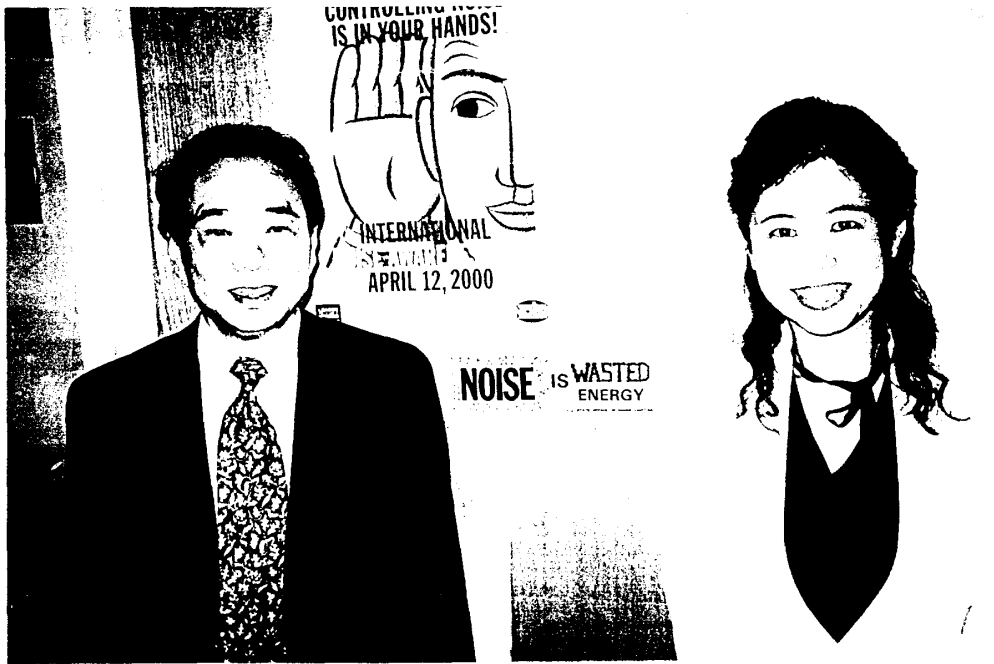
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參訪紐澤西州立大學拜會日瓦林教授 (Eric M. Zwerling)



參訪紐約市環保局拜會  
紐約市環保局局長 Geraldine Kelpin



與美國能源部李正民博士合影於  
紐澤西州立大學



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