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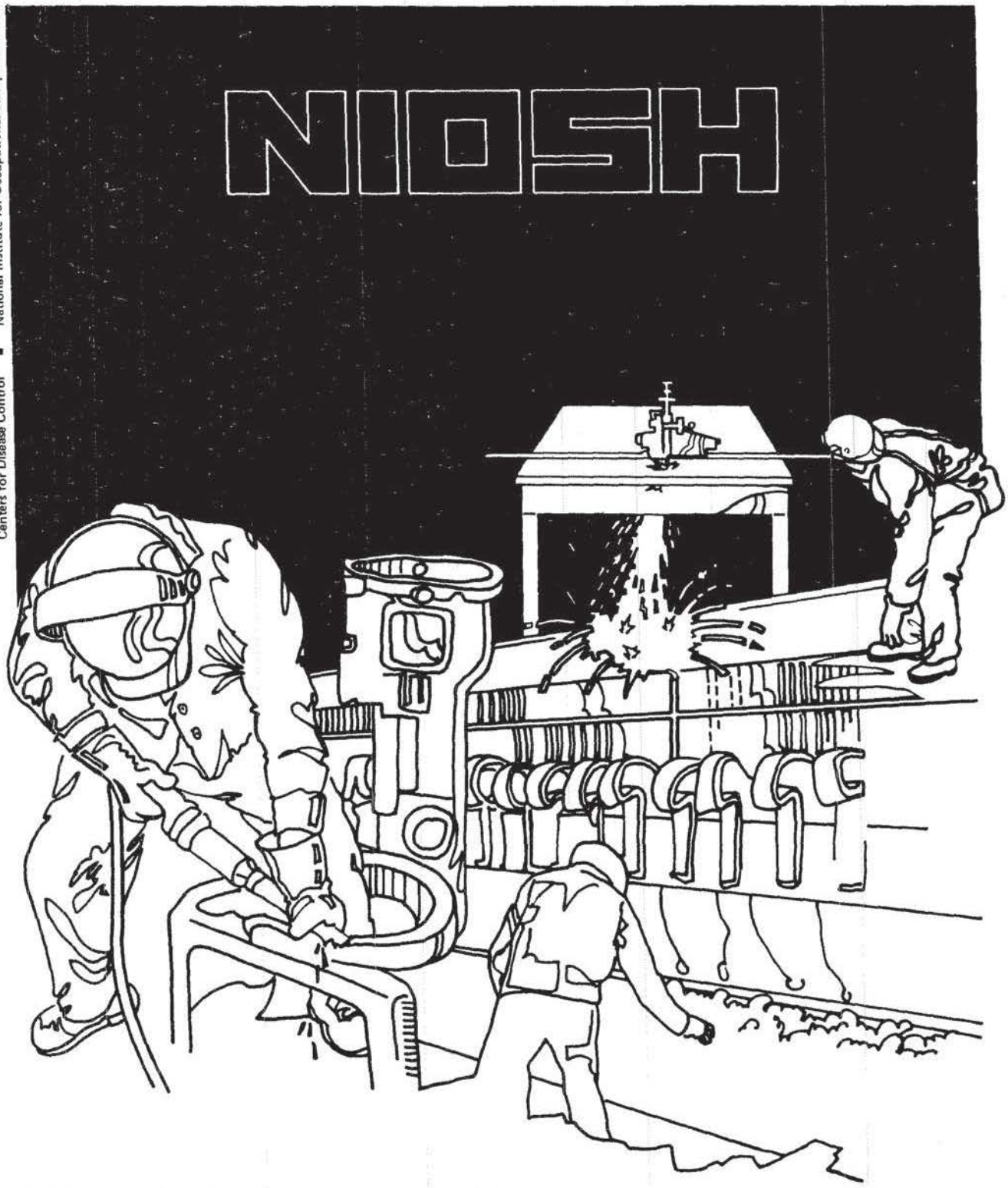

Health Hazard Evaluation Report

HETA 81-066-832
LINCOLN MEDICAL AND
MENTAL HEALTH CENTER
BRONX, YORK

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

HETA 81-066-882
May 1981
Lincoln Medical and
Mental Health Center
Bronx, New York

NIOSH INVESTIGATOR:
Larry McLouth, IH

SUMMARY

On November 10, 1980, the National Institute for Occupational Safety and Health (NIOSH) received a request from Lincoln Medical and Mental Health Center to evaluate potential noise exposure of the service building workers. The area houses the hospital's boilers, air conditioning system, emergency electrical generator, and steam pressure reduction room. The workers in this area include firemen, engineers, oilmen, and mechanics.

On February 12, 1981, NIOSH evaluated the noise levels. Several personal and general area noise dosimeter measurements were taken with Type I noise dosimeters. Two octave band analyses were also performed to isolate the dominant frequencies. The cumulative 7.3-hour noise exposures of the fireman and engineer were 86.8, and 85.0 dBA, respectively. The general area noise measurements taken at the watchman's desk, and between boilers 1 and 2 resulted in cumulative 7-hour noise levels of 84.9 and 90.1 dBA, respectively, The octave band analyses conducted at the same locations indicated that the higher noise levels occurred at lower frequencies: from 31 to 500 Hertz (Hz). Both employees' noise exposures were within the current OSHA standard of 90 dBA (8-hour Time Weighted Average - TWA). However the results indicate that these employees' 8-hour exposures approximate the NIOSH recommended exposure of 85 dBA (8-hour TWA).

Based on the results of noise measurements NIOSH has determined that a potential (though borderline) health hazard existed due to noise exposure at Lincoln Medical and Mental Health Center, Bronx, New York.

Recommendations to reduce noise levels and promote hearing conservation are included in Section VIII of this report.

KEYWORDS: SIC 8062 (General Medical and Surgical Hospitals) noise, hearing impairment, boilers, blowers, turbines.

II. INTRODUCTION

On November 10, 1980, a request for a health hazard evaluation was received from the management of Lincoln Medical and Mental Health Center, Bronx, New York. The request was filed on the basis of potential employee noise exposure in the facility's service building.

III. BACKGROUND

The facility's service building houses 3 boilers, an air conditioning system, an emergency electrical generator, and the steam pressure reduction room. The boilers burn #6 fuel oil to produce steam for heating, sterilization, and to operate the air conditioning system's turbines. The sources of the noise exposure were the boiler's blowers. Generally, 1 boiler is operating and another is on standby, while a third is down for servicing and repair. A maximum of 2 are operated at one time. The floor plan of the service building's first floor appears in Figure 1.

The diesel fuel-powered emergency electrical generator provides electricity to the facility in the event of a municipal power failure. This unit is checked once a week to ensure proper operation. The noise levels produced during its operation are reportedly high. Since this system was not operated during the survey, it was not possible to evaluate noise exposure from this source.

The steam pressure reduction room is the site where the steam pressure is reduced prior to its utilization for sterilization and heating.

The employees in the service building include firemen, maintenance men, engineers, and oilmen. The firemen monitor the control board from the watchman's desk (located in front of boilers 2 and 3). The maintenance men repair and service the machinery, while the oilmen traverse the area and inspect the systems within the building. The engineers supervise these activities. A total of 40 employees are divided among 3 shifts throughout the week.

IV. EVALUATION METHODS

On February 12, 1981, NIOSH conducted an environmental evaluation of the service building. Because they spend the majority of their time in the noisy environment, the fireman's and engineer's exposures were evaluated. Personal and general area noise measurements were conducted with calibrated dB 301 Metrologger Noise Dosimeters (Metrosonics, Inc. Rochester, New York). The sampling periods ranged from 7 to 7.3 hours.

Octave band analyses were conducted at the watchman's desk, and between boiler's 1 and 2 with a calibrated General Radio GR 1982 Sound Level Meter equipped with octave band filters (General Radio Corporation, Concord, Massachusetts). Center band frequencies from 31.5 to 16000 Hertz (Hz) were examined. The locations of both the general area and octave band analyses appear in Figure 1.

EVALUATION CRITERIA

Exposure to excessive noise will cause temporary or permanent hearing losses. Therefore, to hear certain frequencies, the sound pressure level must be increased. These increases measure the degree of hearing loss. Temporary threshold shifts or auditory fatigue are reversible hearing losses. These may occur after a short exposure to intense noise. Normal hearing may be regained after a period of time away from the noise source. However, with prolonged exposure to excessive noise levels, a permanent hearing loss may occur.

Several criteria are used to evaluate the noise exposure of workers. The OSHA Federal Standard in Table G-16 of The General Industry Standards[1] are TWA's which shall not be exceeded. If an employee's noise exposure exceeds the standard, (90 dBA, 8-hr TWA), appropriate engineering, administrative, and personal protective controls shall be instituted.

Both the American Conference of Governmental Industrial Hygienists (ACGIH), and NIOSH recommended noise exposure limits are based on the best available research and information. The ACGIH Threshold Limit Value (TLV) and the NIOSH recommended standard for noise exposure are both 85 dBA (8-hour TWA's).[2,3] It is believed that nearly all workers may be repeatedly exposed at this level without affecting their ability to hear and understand normal speech.

RESULTS

The cumulative 7.3-hour noise exposures of the fireman and the engineer were 86.8, and 85.0 dBA, respectively. The general area noise measurements taken at the watchman's desk, and between boilers 1 and 2 resulted in cumulative 7-hour noise levels of 84.9 and 90.1 dBA, respectively.

The octave band analyses (Table I) conducted at the same locations, indicated that the higher noise levels occurred at lower frequencies: from 31 to 500 Hertz (Hz). In both analyses, the frequency at which the highest sound pressure level occurred was 63 Hz. These results indicate that the noise may be due to vibration.

The equivalent total sound pressure level (dBA) calculated from the octave band analyses, were 91.1 and 82.2 between the boilers, and at the watchman's desk respectively. These values were determined by correcting the octave band readings to A-weighted octave band levels (Table II) and calculating the logarithmic sums of the resulting dB values.

DISCUSSION AND CONCLUSIONS

The data obtained from this study indicate that there is a potential (though borderline) health hazard from noise exposure. Although 7.3-hour TWA's were used to evaluate their exposures, the results suggest that the employees' full 8-hour TWA's would have been at or above the 85 dBA level. Although these

levels are in compliance with the current OSHA standard, they are at or above the ACGIH, and NIOSH exposure limits. Furthermore, under the proposed OSHA standard,[4] any 8-hour TWA exposure greater than or equal to 85 dBA is severe enough to warrant a hearing conservation program.

It was learned from both management and union (American Federation of State County and Municipal Employees, District Council 37 - AFSCME, DC-37) representatives that they agreed upon a worker hearing conservation program. This includes providing the workers with their choice of hearing protection (i.e. ear muffs or plugs), and hearing conservation training by the union. The workers may also seek audiometric testing during work hours if exposures to noise, in excess of the standards, are determined.

VIII. RECOMMENDATIONS

It is recommended that management institute a hearing conservation program as prescribed by the proposed OSHA standard appearing in the Federal Register, Volume 46, Number 11.

It is further recommended that management investigate the use of preventive maintenance and engineering controls to reduce vibration related noise exposure. Preventive maintenance such as lubricating and tightening all parts, and replacing worn parts will reduce noise levels.

IX. REFERENCES

1. General Industry Standards, OSHA Safety and Health Standards (29 CFR 1910) U.S. Department of Labor, Occupational Safety and Health Administration, Table G-16, November 7, 1978.

2. Threshold Limit Values for Chemical Substances and Physical Agents in The Workroom Environment with Intended Changes for 1980, American Conference of Governmental Industrial Hygienists, 1980.

3. Occupational Exposure to Noise, U.S. Dept. of Health, Education, and Welfare, National Institute for Occupational Safety and Health, 1972.

4. Occupational Noise Exposure; Hearing Conservation Amendment, Department of Labor, Occupational Safety and Health Administration, Federal Register, Volume 46, Number 11, January 16, 1981.

X. AUTHORSHIP AND ACKNOWLEDGEMENTS

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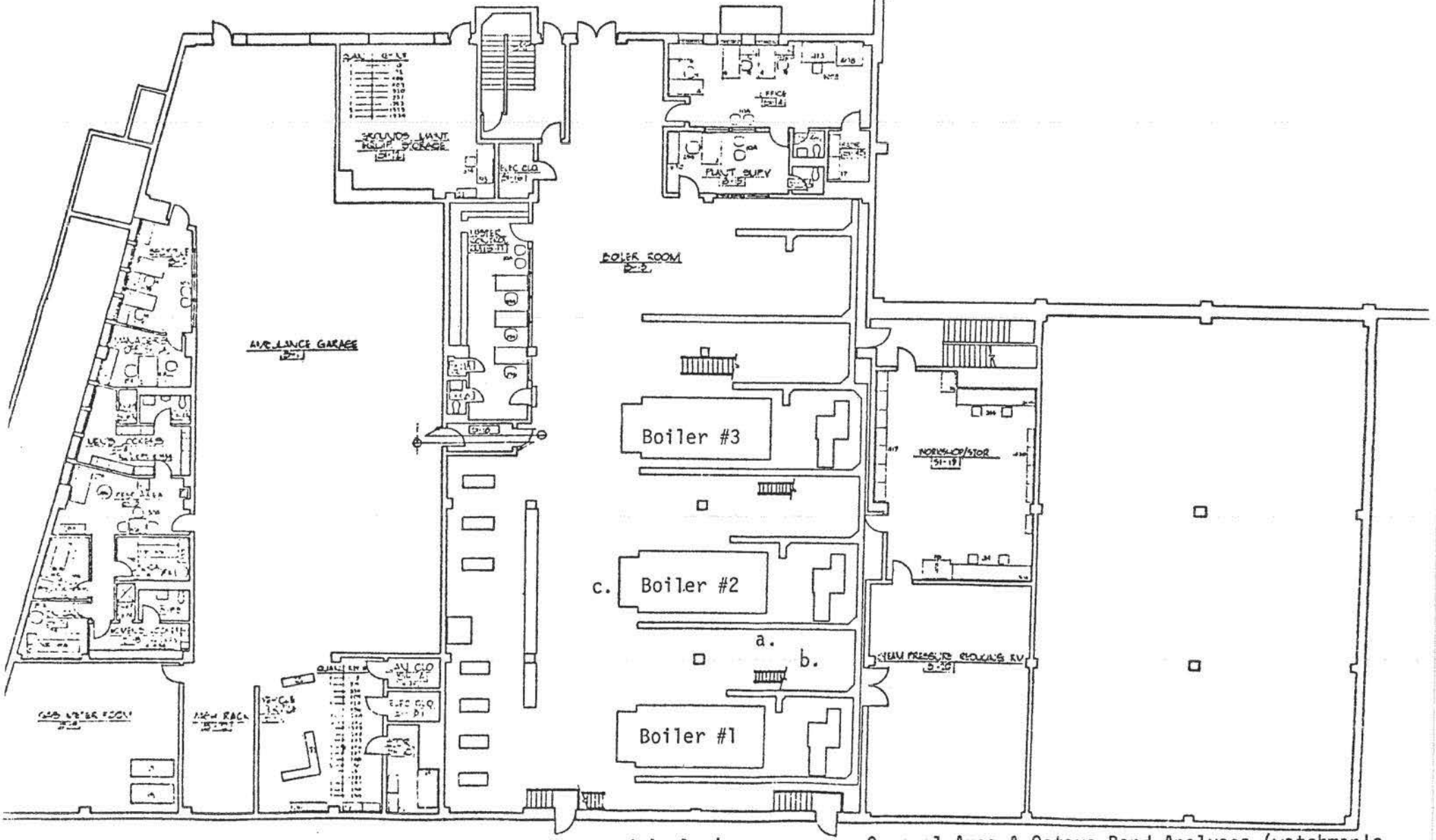
XI. DISTRIBUTION AND AVAILABITY OF REPORT

Copies of this report are currently available, upon request, from NIOSH, Division of Technical Services, Publications Dissemination, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia 22161.

Copies of this report have been sent to:

1. Lincoln Medical and Mental Health Center, Bronx, New York
2. American Federation of State County and Municipal Employees, DC-37
3. U.S. Department of Labor (OSHA), Region II
4. NIOSH, Region II

FIGURE 1
First Floor-Service Building
Lincoln Medical & Mental Health Center
February 12, 1981



a. General Area b. Octave Band Analysis c. General Area & Octave Band Analyses (watchman's desk)

TABLE I

OCTAVE BAND ANALYSES[a]

LINCOLN MEDICAL AND MENTAL HEALTH CENTER
FEBRUARY 12, 1981

Location	Center Band Frequency (Hertz)										
	31.5	63	125	250	500	1000	2000	4000	8000	16000	dBA Total
Between boilers #1 & 2	91	90	89	89	90	84	83	80	76	72	
SPL dBA (corrected)[b].	52.0	64	73	80	87	84	84	81	75	65	91.1
At watchman's desk (facing boiler #2)	85	88	86	82	80	77	73	69	63	55	
SPL dBA (corrected)[b].	46	62	70	73	77	77	74	70	62	48	82.2

a. Sound Pressure Level (SPL): $SPL = 20 \log \frac{P}{P_o}$

where P = measured SPL

P_o = reference SPL: 20 micropascals (uPa)

b. See Table II

TABLE II

A, B, and C Weighting Networks

Lincoln Medical and Mental Health Center
Bronx, New York
February 12, 1981

Frequency Hz	A-Weighting Relative Response dB	B-Weighting Relative Response dB	C-Weighting Relative Response dB
10	-70.4	-38.2	-14.3
12.5	-63.4	-33.2	-11.2
16	-56.7	-28.5	- 8.5
20	-50.5	-24.2	- 6.2
25	-44.7	-20.4	- 4.4
31.5	-39.4*	-17.1	- 3.0
40	-34.6	-14.2	- 2.0
50	-30.2	-11.6	- 1.3
63	-26.2*	- 9.3	- 0.8
80	-22.5	- 7.4	- 0.5
100	-19.1	- 5.6	- 0.3
125	-16.1*	- 4.2	- 0.2
160	-13.4	- 3.0	- 0.1
200	-10.9	- 2.0	0
250	- 8.6*	- 1.3	0
315	- 6.6	- 0.8	0
400	- 4.8	- 0.5	0
500	- 3.2*	- 0.3	0
630	- 1.9	- 0.1	0
800	- 0.8	0	0
1000	0*	0	0
1250	+ 0.6	0	0
1600	+ 1.0	0	- 0.1
2000	+ 1.2*	- 0.1	- 0.2
2500	+ 1.3	- 0.2	- 0.3
3150	+ 1.2	- 0.4	- 0.5
4000	+ 1.0*	- 0.7	- 0.8
5000	+ 0.5	- 1.2	- 1.3
6300	- 0.1	- 1.9	- 2.0
8000	- 1.1*	- 2.9	- 3.0
10000	- 2.5	- 4.3	- 4.4
12500	- 4.3	- 6.1	- 6.2
16000	- 6.6	- 8.4	- 8.5
20000	- 9.3	-11.1	-11.2

* Values used for converting octave band readings into A-weighted sound levels.

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