USAFOEHL REPORT

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NOISE HAZARD ASSESSMENT OF THE ENCLOSED PRIMARY COOLING TOWER SYSTEM AT CHEYENNE MOUNTAIN AFS CO

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September 1988

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Final Report

USAF Occupational and Environmental Health Laboratory
Human Systems Division (AFSC)
Brooks Air Force Base, Texas 78235-5501

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A comprehensive site assessment was conducted by USAFOEHL personnel to measure and evaluate noise levels and provide appropriate recommendations with respect to noise induced whole-body and auditory effects inside the Cooling Tower Platform Chamber and the Primary Air Exhaust Tunnel at Cheyenne Mountain Air Force Station, Colorado. The survey was performed between 21-22 March 1988 to determine the health effects of noise on personnel at locations serviced by the 1010 CES/DEMME, Hydraulics Shop. Survey measurements and data analysis results of four selected locations are reported. To provide a comprehensive assessment of the site, survey results are compared to applicable standards. Finally, exposure control alternatives and recommendations are made with respect to noise exposure. Exposure control measures and recommendations are made to prevent hearing loss based on the assumption of exposure to the worst measured noise levels. The whole body effects limit was not exceeded. Keywords.

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CONTENTS

I. INTRODUCTION

A. Purpose: This report presents results and provides analysis of noise data collected during the survey of the Cooling Tower Platform Chamber and the Primary Air Exhaust Tunnel (consisting of the Cooling Tower Air Exhaust Shaft and the Cooling Tower Air Exhaust Valve Chamber) at Cheyenne Mountain Air Force Station, Colorado. USAF Clinic Peterson/SGPB requested the survey to determine the health effects of noise on personnel at locations serviced by the 1010 CES/DEMME, Hydraulics Shop. The results of this report provide the necessary information to assess the extent and severity of noise induced health hazards with respect to whole body and auditory effects. The survey was conducted between 21 and 22 March 1988.

B. Problem: The USAF Clinic Peterson/SGPB's initial assessment of the site estimated high sound levels above 120 dB(A) dominated by low frequencies. This raised concern for possible overexposure to high levels of sound dominated by low frequencies affecting both the whole-body and the auditory system. The above estimate was based on a tentative survey inside the Primary Air Exhaust Tunnel using a sound level meter with a range limit of 120 dB(A). A total of nine fans can be added on line to provide positive air pressure to move air through and out of the complex. It is not known how many fans were on line during that survey. An accurate health hazard assessment of this unique work environment required specific survey techniques, instrumentation and analyses of data beyond the capability of the base Bioenvironmental Engineering office.

C. Scope: A comprehensive site assessment was conducted by USAFOEHL personnel to measure and evaluate noise levels and provide appropriate recommendations with respect to noise induced whole-body and auditory effects. Survey measurements and data analysis results of the four selected locations are reported. To provide a comprehensive assessment of the site, applicable standards are also reported, integrated, and compared with survey results. Finally, exposure control alternatives and recommendations are made to provide a comprehensive noise exposure hazard assessment of the site.

II. DISCUSSION

A. Methodology

1. Instrumentation: One portable, four-channel tape recording system was used to record approximately 60 to 100 seconds of continuous noise per sample on audio tape for later analysis at USAFOEHL. For quality assurance and control of sampled data, two direct (AM) and two frequency modulated (FM) channels were used. The combined record-reproduce frequency response is 1 Hertz (Hz) to 50 kilo Hertz (kHz). Recording speed was set to 380 mm/sec to capture infrasound frequencies, low frequencies and high frequencies below ultrasound. At these recording speeds, the frequency modulated (FM) channel record-reproduce response covers the infrasound region (1 to 20 Hz) up to 10 kHz. The direct (AM) channel record-reproduce response covers the range between 100 Hz up to 50 kHz. However, a condenser type microphone was used with a dynamic range of 153 dB and a frequency response of 1 Hz to 20 kHz. A complete list of equipment used is given in Appendix A.

2. Data Acquisition:

a. Near field noise data were collected at four locations inside the complex. A walk-through sound level scan of the whole complex using a hand held sound level meter was performed prior to data collection. These locations were selected based on two factors; the locations where individuals spend 95 percent or more of their time, and the results of the hand held sound level meter scan. Figure 1 shows the locations of each sampling station inside the complex. Five sets of samples were collected at stations 1, 3 and 4 by adding sequentially one fan on line until the total number of operating fans reached five. Sound levels were not measured with more than five fans running because of the safety problem with high wind speeds. Only one sample was collected at station 2 because station 2 sound levels were always lower than station 1. Noise measurements were limited to noise generated by a maximum of five fans. This limit was imposed by the wind turbulence hazard and overestimation of noise levels due to wind effects if six fans or more had been on line. Even with five fans on line it was difficult to hold survey equipment in place because of the high air velocity. For example, a hard hat and government issued prescription glasses became flying objects when the survey team exited the door leading to the cooling tower air exhaust shaft.

b. To simulate actual exposure, the microphone attached to a hand held pole was directed at grazing incidence to airflow (90 degree incidence) where it vertically scanned sound levels from approximately 0.5 to 3 meters above standing ground level. Then, the microphone was moved horizontally along a circular pattern of approximately 1.5 meters diameter at 1.5 meters above standing ground level. The same procedure was repeated at each sampling location during data acquisition. Vertical and horizontal scanning provided a three dimensional approach rather than a point approach with a fixed height microphone. This provided the necessary simulation for whole-body and auditory exposure of individuals at various body positions. Together, scanning and time-integrating also reduced anomalies frequently present in data acquired by a fixed height microphone and provided the necessary representative samples for individuals working in these areas.

3. Data Analysis:

a. For quality assurance, each track of the tape recorded samples was played through an oscilloscope before being fed into the one-third octave band analyzer. Either 30 or 60 seconds of continuous usable data was fed into the computerized one-third octave band analyzer for the derivation of the root-mean-square (rms) values of sound pressure levels presented in Appendix C. The derived rms values are used for further analyses, data reduction, and reproduction of tables and graphs presented throughout this report.

b. Since multiple exposure time durations for the whole complex varied, depending on the maintenance tasks being performed, the maximum measured non-weighted octave band sound pressure and the A-weighted sound levels were used for whole body effects evaluation. To evaluate hearing protection requirements for the overall daily duration exposure time limits for the whole complex, the maximum measured overall sound level, A-weighted, (OASLA) was considered. Station 3 consistently showed higher sound levels than any other station. Therefore, station 3 was used to evaluate exposure time limits for hearing protection.

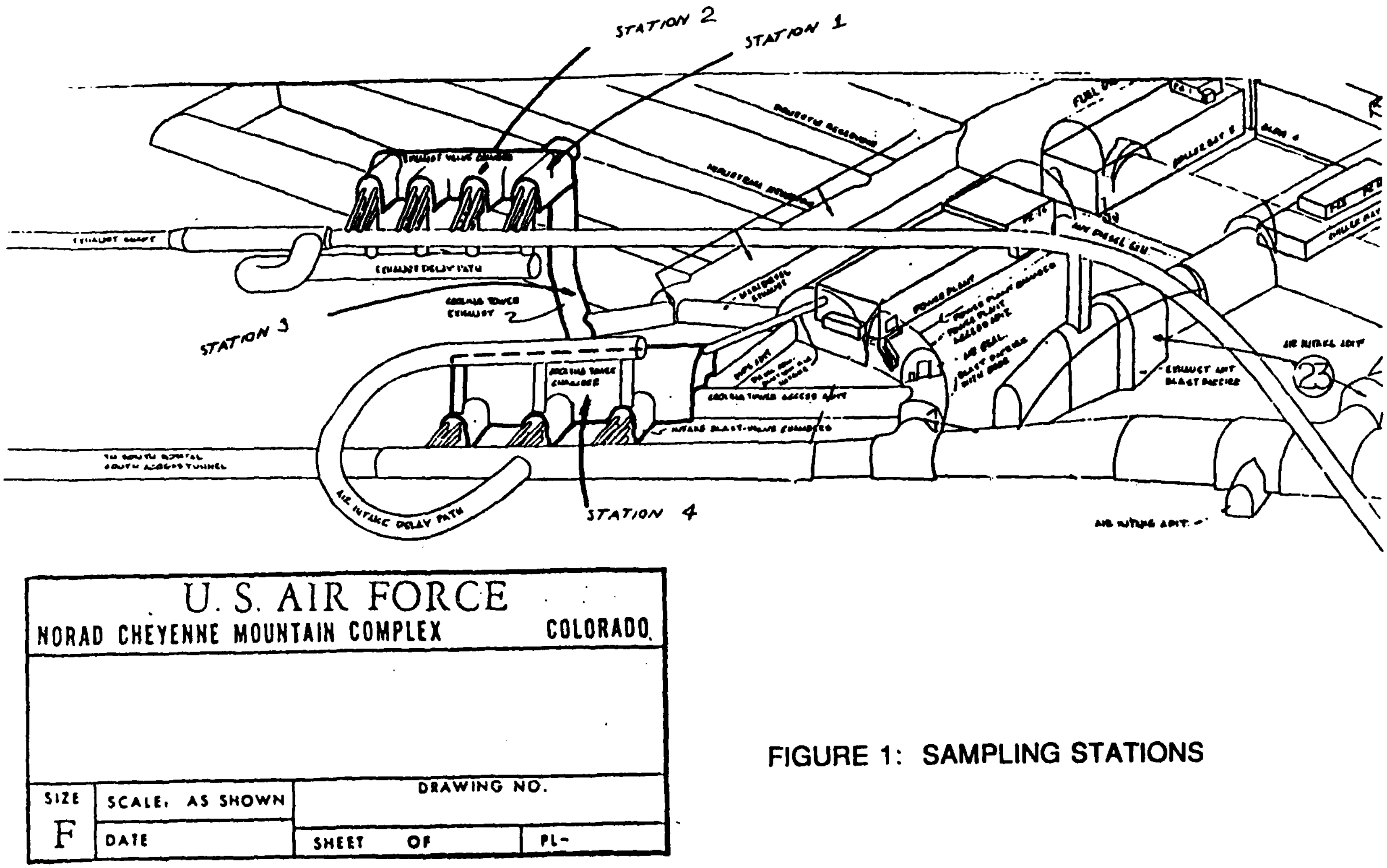

FIGURE 1: SAMPLING STATIONS

B. Standards

1. Whole Body Effects: AFR 161-35, Hazardous Noise Exposure, lists a ceiling limit of 150 dB(A) for the OASLA and 145 dB for any one-third or full octave band SPL for protection with respect to whole-body effects. AFR 161-35 does not provide daily exposure time limits below the ceiling limit.

2. Hearing: AFR 161-35 also lists the daily exposure time limit for hearing protection as an equivalent daily 8-hour exposure of 84 dB(A). A four dB(A) increase in exposure is allowed for each halving of exposure time, so that, for example, exposure to 88 dB(A) is allowed for a time of four hours, 92 dB(A) for two hours, etc. No unprotected exposure to levels above 115 dB(A) is allowed.

C. Results

1. Whole Body Effects: The measured noise levels were below the standard. Station 3 noise levels were higher than any other station under all conditions. The maximum measured octave band sound pressure level was 114 dB at station 3 with three fans on line. Maximum octave band sound pressure levels decreased with four and five fans on line. The maximum measured OASLA was 103 dB(A) at station 3 with five fans on line. Integrated noise results for whole-body effects are presented in Appendix B. Figure B-2 (Appendix B) shows a summary of the maximum measured one-third and full octave band sound pressure levels and compares them with the 145 dB ceiling limit standard.

2. Hearing

a. When compared with the 84 dB(A) standard the measured OASLA at any station under all conditions exceeded the standard and ranged between 87 and 103 dB(A). The one-third octave band analysis results (Appendix D) show these levels at each station and for each run.

b. Two methods are used to determine hearing protection. The single number attenuation method utilizes a single attenuation factor. This value is based on the difference between the overall sound level, C-weighted (OASLC), and the overall sound level, A-weighted (OASLA). The attenuation of various protectors are specified based on this difference. This specified attenuation factor is subtracted from the actual measured OASLA to evaluate individual exposure with protection in use. The second method, called the octave band method, subtracts an attenuation factor for each octave band from the measured sound pressure level in each octave band. The OASLA is then calculated to evaluate exposures to individuals while using the protection. Since data is normally not available on attenuation factors below the 125 Hz octave band it was assumed attenuation was zero in these bands. The use of the octave band method generated lower daily exposure time limits. Hearing protection in combination with exposure control time limits are tabulated in Tables C-1 through C-2, Appendix C. Table C-1 provides a tabulation of the continuous single exposure time limits for each station using an overall single attenuation factor. Table C-2 shows the overall maximum durations of daily exposure time limits for multiple exposures under all conditions with a maximum of five fans on line. Table C-2 data was taken from the highest measured OASLA during the entire survey and then a single attenuation factor was applied to each octave before being A-Weighted (dB method). Station 3 with five fans on line showed the highest overall A-weighted sound level.

III. CONCLUSIONS

A. The noise induced by the cooling tower centrifugal fans is not hazardous with respect to noise-induced whole-body effects with five fans or less on line. High turbulence prevented data collections for six or more fans on line.

B. The noise induced by the cooling tower centrifugal fans is hazardous to the auditory system. Hearing protection and exposure time limits are required.

C. Even though higher noise levels are believed to be generated under the diffusers and at the door, these locations were not surveyed due to high turbulence hazard on personnel and survey equipment. Turbulence also prevented sampling at the middle of the ladder.

IV. RECOMMENDATIONS

A. Since noise levels for six or more fans were not measured inside the primary air exhaust tunnel, recommend personnel exposure be limited to noise generated from five fans inside the Cooling Tower Air Exhaust Shaft and inside the Exhaust Valve Chamber. When overall operational requirements dictate the use of six fans or more while individuals are inside the air exhaust shaft, recommend the use of the recently constructed Secondary Air Exhaust System.

B. Individuals should spend as little time as possible directly under the diffuser outlets, at the door, and on the ladder. These locations are believed to have higher risk levels than the surveyed locations.

C. Recommended daily exposure time limits with hearing protection are provided in Table 1.

TABLE 1: Overall Summary of Recommended Maximum Daily Exposure Time Limit Versus Their Corresponding Maximum Exposure Level, Using Both of the A-weighted [dB(A)] and the Unweighted [dB] Methods (with and without hearing protection devices) For Auditory System Protection.

METHOD AND SITUATION DESCRIPTION	ENVIRONMENTAL CONDITION		NONE	TYPE OF HEARING PROTECTION(1)						
					INSERT		MUFF		COMBINATION	
	STATION NUMBER	TOTAL # OF FANS ON LINE	OASLA dB(A)	DAIL PETL (4)	OASLA dB(A)	DAILY PETL MIN.	OASLA dB(A)	DAILY PETL MIN.	OASLA dB(A)	DAILY PETL MIN.
Continuous	1	5	92.9	103	76.9	*	75.9	*	64.9	*
Single(2)	2	5	88.3	231	72.3	*	71.3	*	60.3	*
Exposure	3	1	97.6	45	77.[illegible]	*	72.6	*	65.6	*
Using OASLA	3	2	100.3	28	80.3	914	75.3	*	68.3	*
dB(A) Method	3	3	101.7	22	83.7	507	79.7	1015	70.7	*
[C-A FACTORS]	3	4	102.3	20	84.3	503	80.3	914	71.3	*
	3	5	103.0	18	85.0	404	81.0	807	72.0	*
	4	5	95.4	66	77.4	*	73.4	*	64.4	*
CONTINOUS MULTIPLE EXPOSURE USING THE OCTAVE BAND METHOD(3)	3	5	103.0	18	86	340	81	807	77.5	*

(1) Hearing protection was calculated for E.A.R Foam Insert, Wilson 365 Muff and their combination.

(2) Results extracted from Table (C-1), Appendix C.

(3) Results Extracted from table (C-2), Appendix C.

(4) PETL Permissible Exposure Time Limit in Minutes.

* Below 78 dB(A) (Time limits Are Not Required).

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APPENDIX A
Measurement System Equipment Configuration,
Calibration, and Analysis List

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B & K 7006 RECORDING SYSTEM CONFIGURATION LIST

Equipment/Instrument	Model/Type	Serial Number
B & K Tape Recorder	7006	1307051
B & K Microphone Power Supply	2804	1338144
B & K Microphone Preamplifier	2639	1334752
B & K AM Unit (Channel 1)	ZE0299	N/A
B & K AM Unit (Channel 2)	ZE0299	N/A
B & K FM Unit (Channel 3)	ZM0053	N/A
B & K FM Unit (Channel 4)	ZM0053	N/A
LARSON/DAVIS Microphone	2541	1072

B & K 7006 RECORDING SYSTEM CALIBRATION INSTRUMENT LIST

Equipment/Instrument	Model/Type	Serial Number
B & K Piston Phone Calibrator	4220	1048870
H.P. Distortion Analyzer	334A	1140A11082
H.P. Synthesizer/Function Generator	3325A	2512A22219

DATA ANALYSIS INSTRUMENT LIST

Instrument	Model/Type	Serial Number
B & K Digital Frequency Analyzer	2131	1123172
H.P. Desktop Computer	9000/226	2406A28155
Tektronix Oscilloscope	2230	B020113

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APPENDIX B

Graphically Integrated Whole-Body Effect Related Data
(Standards and Measurements)

Table B-1: Overall Summary of The One-Third Octave Band Data Analysis Results With Respect to Station Number and Total Number of Fans on Line.

STATION NUMBER	TOTAL NUMBER OF FANS ON LINE	MAXIMUM MEASURED SPL				CORRESPONDING OVERALL LEVELS			CORRESPONDING
		1/3 OCTAVE		FULL OCTAVE					
		SPL dB	NOMINAL FREQUENCY Hz	SPL dB	NOMINAL FREQUENCY Hz	OASPL dB	OASLC dB(C)	OASLA dB(A)	C-A VALUE
1	1	94.4	10	97.9	12.5	103.2	98.7	87.2	+ 11.5
1	2	98.6	25	99.8	31.5	105.7	101.0	89.7	+ 11.3
1	3	108.0	25	108.3	31.5	110.6	106.1	91.1	+ 15.0
1	4	110.4	25	110.6	31.5	112.6	107.6	91.9	+ 16.0
1	5	111.8*	25	112.0*	31.5	113.5*	109.1*	92.9*	+ 16.2
2	5	109.0	25	109.2	31.5	111.0	106.6	88.3	+ 18.2
3	1	99.7	10	103.2	12.5	108.4	104.6	97.6	+ 07.0
3	2	100.4	6.3	103.8	12.5	110.6	106.9	100.3	+ 06.6
3	3	113.9*	25	114.0*	31.5	116.5*	112.0*	101.7	+ 10.4
3	4	111.9	25	112.1	31.5	116.0	111.4	102.3	+ 09.1
3	5	109.2	25	109.6	31.5	115.2	111.0	103.0*	+ 08.0
4	1	95.8	25	96.4	31.5	99.9	97.3	85.8	+ 11.5
4	2	97.8	25	98.6	31.5	102.3	99.8	88.3	+ 11.3
4	3	99.0	25	100.1	31.5	103.8	101.5	90.8	+ 10.6
4	4	100.8	25	103.1	31.5	106.0	103.4	93.3	+ 10.2
4	5	101.8*	25	104.4*	31.5	108.3*	105.9*	95.4*	+ 10.5

* Highest measured value for the corresponding station (location) with respect to the total number of fans on line.

FIGURE B-1: OVERALL SUMMARY OF MEASURED A-WEIGHTED SOUND LEVELS dB(A) WITH RESPECT TO STATION NUMBER AND TOTAL NUMBER OF FANS ON LINE

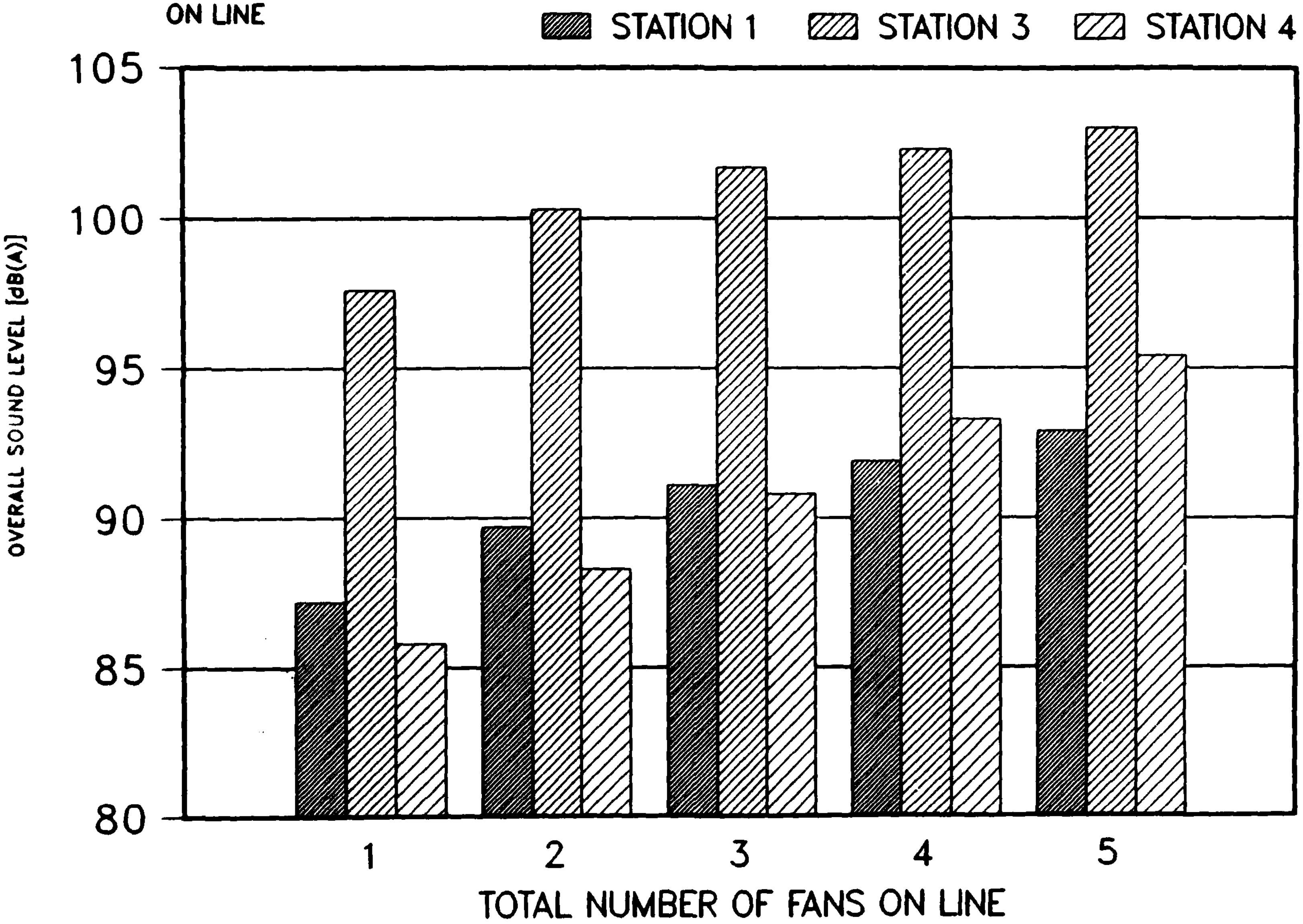
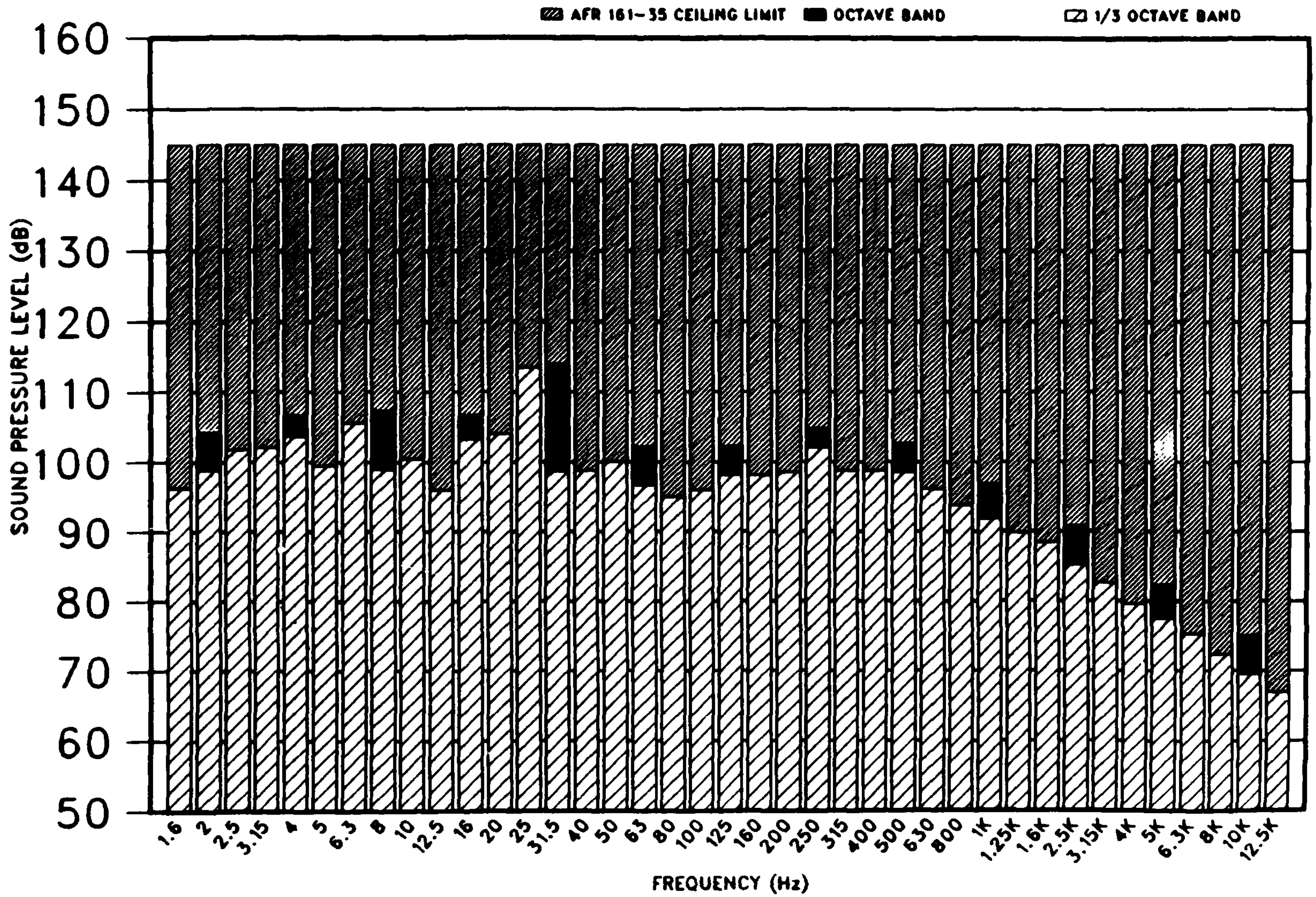


Table B-2: Maximum Measured Sound Pressure Levels (SPL dB)

BAND CENTER FREQ. Hz	MAXIMUM MEASURED SPL (dB) - ALL CONDITIONS - ALL LOCATIONS					
	1/3 OCTAVE			FULL OCTAVE		
	DATA	LOCATION #	# OF FANS	DATA	LOCATION #	# OF FANS
1.6	96.3	3	4, 5			
2	98.9	3	4, 5	104.3	3	4
2.5	101.8	3	4			
3.5	102.1	3	4			
4	103.7	3	5	106.7	3	4
5	99.5	3	4			
6.3	105.6	3	5			
8	99.0	3	5	107.4	3	5
10	104.0	3	5			
12.5	96.0	3	5			
16	103.2	3	5	106.8	3	3
20	104.0	3	3			
25	113.5	3	3			
31.5	98.8	4	5	114.0	3	3
40	96.7	4	5			
50	100.0	3	5			
63	96.7	3, 4	4, 5	102.3	4	5
80	95.0	3	5			
100	96.0	3	5			
125	98.2	3	5	102.3	3	5
160	98.1	3	5			
200	98.5	3	5			
250	102.1	3	5	104.9	3	5
315	98.8	3	5			
400	98.7	3	5			
500	98.6	3	5	102.7	3	5
630	96.1	3	5			
800	98.3	3	5			
1000	91.8	3	5	96.9	3	5
1250	89.4	3	5			
1600	88.4	3	5			
2000	85.2	3	5	90.8*	3	5
2500	82.6	3	5			
3150	79.6	3	5			
4000	77.5	4	5	82.4	4	5
5000	75.3	4	5			
6300	72.4	4	5			
8000	69.5	4	5	75.1	4	5
10000	67.0	4	5			
12500	66.5	4	5			

FIGURE B-2: SUMMARY OF MEASURED OCTAVE BAND SOUND PRESSURE LEVELS (MAXIMUM MEASURED LEVEL - ALL LOCATIONS - ALL CONDITIONS) WITH RESPECT TO AFR 161-35 WHOLE-BODY EFFECT CEILING LIMIT



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APPENDIX C

Auditory Effect and Hearing Protection Related Data

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TABLE C-1: Overall Maximum Durations of Continuous Single Daily Exposure Time Limits (Minutes Per Day) for Hearing Protection Using the Overall A-Weighted Sound Level (OASLA) Method With Respect to Each Station and the Total Number of Fans On Line.

LOCATION & CONDITION			TYPE OF HEARING PROTECTION										
			NONE		E.A.R FOAM INSERT(1)			WILSON 365 EAR MUFF(2)			COMBINATION		
STATION NUMBER	NUMBER OF FANS ON LINE	dB(C) dB(A) VALUE (C-A)	MEASURED OASLA dB(A) UASEL(3)	DAILY PETL (4)	SNAF dB(A) (5)	OASLA dB(A) ASEL (6)	DAILY PETL	SNAF dB(A)	OASLA dB(A) ASEL	DAILY PETL	SNAF dB(A)	OASLA dBA dB(A) ASEL	DAILY PTEL
			J		K	J-K		L	J-L		M	J-M	
1	1	11.5	87.2	280	8	69.2	*	22	65.2	*	31	56.2	*
1	2	11.3	89.7	180	18	71.7	*	22	67.7	*	31	58.7	*
1	3	15.0	91.1	140	16	75.1	*	17	74.1	*	28	63.1	*
1	4	16.0	91.9	122	16	75.9	*	17	74.9	*	28	63.9	*
1	5	16.2	92.9	103	16	76.9	*	17	75.9	*	28	64.9	*
2	5	18.2	88.3	231	16	72.3	*	17	71.3	*	28	60.3	*
3	1	7.0	97.6	45	20	77.6	*	25	72.6	*	32	65.6	*
3	2	6.6	100.3	28	20	80.3	914	25	75.3	*	32	68.3	*
3	3	10.4	101.7	22	18	83.7	507	22	79.7	1015	31	70.7	*
3	4	9.1	102.3	20	18	84.3	503	22	80.3	914	31	71.3	*
3	5	8.0	103.0	18	18	85.0	404	22	81.0	807	31	72.0	*
4	1	11.5	85.8	352	18	67.8	*	22	63.8	*	31	54.8	*
4	2	11.3	88.3	231	18	70.3	*	22	66.3	*	31	57.3	*
4	3	10.6	90.8	145	18	72.8	*	22	68.8	*	31	59.8	*
4	4	10.2	93.3	94	18	75.3	*	22	71.3	*	31	62.3	*
4	5	10.5	95.4	66	18	77.4	*	22	73.4	*	31	64.4	*

(1) Calculated for E.A.R Foam Insert used by maintenance personnel at the site.
(2) Calculated for Wilson 365 Muff for maximum protection under all conditions.
(3) Overall A-Weighted Sound Level (OASLA) Un-Attenuated Sound Exposure Level (UASEL).
(4) Daily Permissible Exposure Time Limit in Minutes (PETL).
(5) Overall A-Weighted Sound Level (OASLA) Single Number Attenuation Factor (SNAF) obtained from AFR 161-35.
(6) Attenuated Sound Exposure Level (ASEL).
* Below 78 dB(A) (Time Limits Are Not Required).

TABLE C-2: Overall Durations of Maximum Permissible Daily Exposure Time Limit (Worst Case Scenario at Station 3 With 5 Fans On Line), Using the Un-weighted Single Octave Band Sound Pressure Level (dB) Attenuation Method For Hearing Protection Under All Conditions and Situations (MAXIMUM OF FIVE FANS ON LINE).

OCTAVE BAND CENTER FREQUENCY [Hz]	MAXIMUM POSSIBLE EXPOSURE		TYPE OF HEARING PROTECTION								
			E.A.R FOAM INSERT			WILSON 365 EAR MUFF			COMBINATION		
	SPL (dB) (1)	SPLA dB(A) (2)	ATF (dB) (3)	ATSPL (d(B) (4)	ATSLA [dB(A)] (5)	ATF [dB]	ATSPL [dB]	ATSLA [dB(A)]	ATF [dB] [dB]	ATSPL [dB]	ATSLA [dB(A)]
	A		B	A-B		C	A-C		D	A-D	
2	103.4	21.1	0*	103.4	21.13	0*	103.4	-21.1	0*	103.4	-21.1
4	105.9	5.2	0	105.9	5.2	0	105.9	5.2	0	105.9	5.2
8	107.4	29.8	0	107.4	29.8	0	107.4	29.8	0	107.4	29.8
16	106.2	49.5	0	106.2	49.5	0	106.2	49.5	0	106.2	49.5
31.5	109.6	70.2	0	109.6	70.2	0	109.6	70.2	0	109.6	70.2
63	101.3	75.1	0	101.3	75.1	0	101.3	75.1	0	101.3	75.1
125	102.3	86.1	22	80.3	64.1	13	89.3	73.1	25	77.3	61.1
250	104.9	96.2	15	89.9	81.2	20	84.9	76.2	30	74.9	66.2
500	102.7	99.4	18	84.7	81.4	27	75.7	72.4	33	69.7	66.4
1000	96.9	96.6	18	78.9	78.9	36	60.9	60.9	33	63.9	63.9
2000	90.8	92.0	29	61.8	63.0	34	56.8	58.0	35	55.8	57.0
4000	81.7	82.7	33	48.4	49.7	36	45.7	46.7	43	38.7	39.7
8000	71.0	69.9	29	42.0	40.9	25	46.0	44.9	36	35.0	33.9
OASLA	NA	103.0	NA	NA	86	NA	NA	81.	NA	NA	77.5
PDETL(6)			340 MINUTES			807 MINUTES			NO TIME LIMIT		

(1) SPL Un-weighted Sound Pressure Level dB.
(2) SPLA A-weighted Sound Level dB(A).
(3) ATF Attenuation Factor in Decibels (dB).
(4) ATSPL Attenuated Sound Pressure Level in Decibels (dB).
(5) ATSLA Attenuated Sound level { [A-Weighted [dB(A)] }.
(6) PDETL Permissible Daily Exposure Time Limit in Minutes.
* AFR 161-35 does not provide attenuation factors for center frequency bands below 125 Hertz. Zero attenuation factor was applied due to concentration of high sound pressure levels below 125 Hertz . See Appendix D for more details.

APPENDIX D

One-Third and Full Octave Band Data

TABLE D-1: MEASURED SPECTRUM LEVELS.
LOCATION: COOLING TOWER AIR EXHAUST VALVE CHAMBER.
POSITION: STATION 1
CONDITION: 1 FAN

FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	78.1	0.0	0.0			
2	76.4	0.0	0.0	81.6	0.0	0.0
2.5	75.7	0.0	0.0			
3.15	92.0	0.0	0.0			
4	86.7	0.0	0.0	93.3	0.0	0.0
5	78.7	0.0	0.0			
6.3	84.7	0.0	0.0			
8	94.1	0.0	0.0	97.8	24.5	80.6
10	94.9	24.5	80.6			
12.5	91.8	28.4	80.6			
16	93.0	36.3	84.5	96.3	40.8	87.7
20	89.0	38.5	82.8			
25	88.1	43.4	83.7			
31.5	86.7	47.3	83.7	91.9	53.6	88.7
40	86.5	51.9	84.5			
50	93.7	63.5	92.4			
63	85.4	59.2	84.6	94.7	66.7	93.6
80	84.7	62.2	84.2			
100	86.4	67.3	86.1			
125	88.2	72.1	88.0	92.5	77.3	92.4
160	88.5	75.1	88.4			
200	86.3	75.4	86.3			
250	88.5	79.9	88.5	91.6	83.0	91.6
315	84.8	78.2	84.8			
400	83.9	79.1	83.9			
500	82.5	79.3	82.5	86.9	83.3	86.9
630	78.6	76.7	78.6			
800	74.8	74.0	74.8			
1000	71.4	71.4	71.4	77.1	76.8	77.1
1250	69.0	69.6	69.0			
1600	66.9	67.9	66.8			
2000	62.2	63.4	62.0	68.6	69.6	68.4
2500	58.2	59.5	57.9			
3150	54.5	55.7	54.0			
4000	52.1	53.1	51.3	57.7	58.7	57.0
5000	51.8	52.3	50.5			
6300	51.8	51.7	49.8			
8000	53.0	51.9	50.0	58.2	56.8	54.9
10000	54.8	52.3	50.4			
12500	56.0	51.7	49.8			

OVERALL LEVELS (1.6 - 12500 HZ)

OASPL = 103.2 dB   OASLA = 87.2 dB(A)

OASLC = 98.7 dB(C)   C-A VALUE = +11.5

FIGURE D-1: COOLING TOWER AIR EXHAUST VALVE CHAMBER
STATION 1 – 1 FAN OPERATING

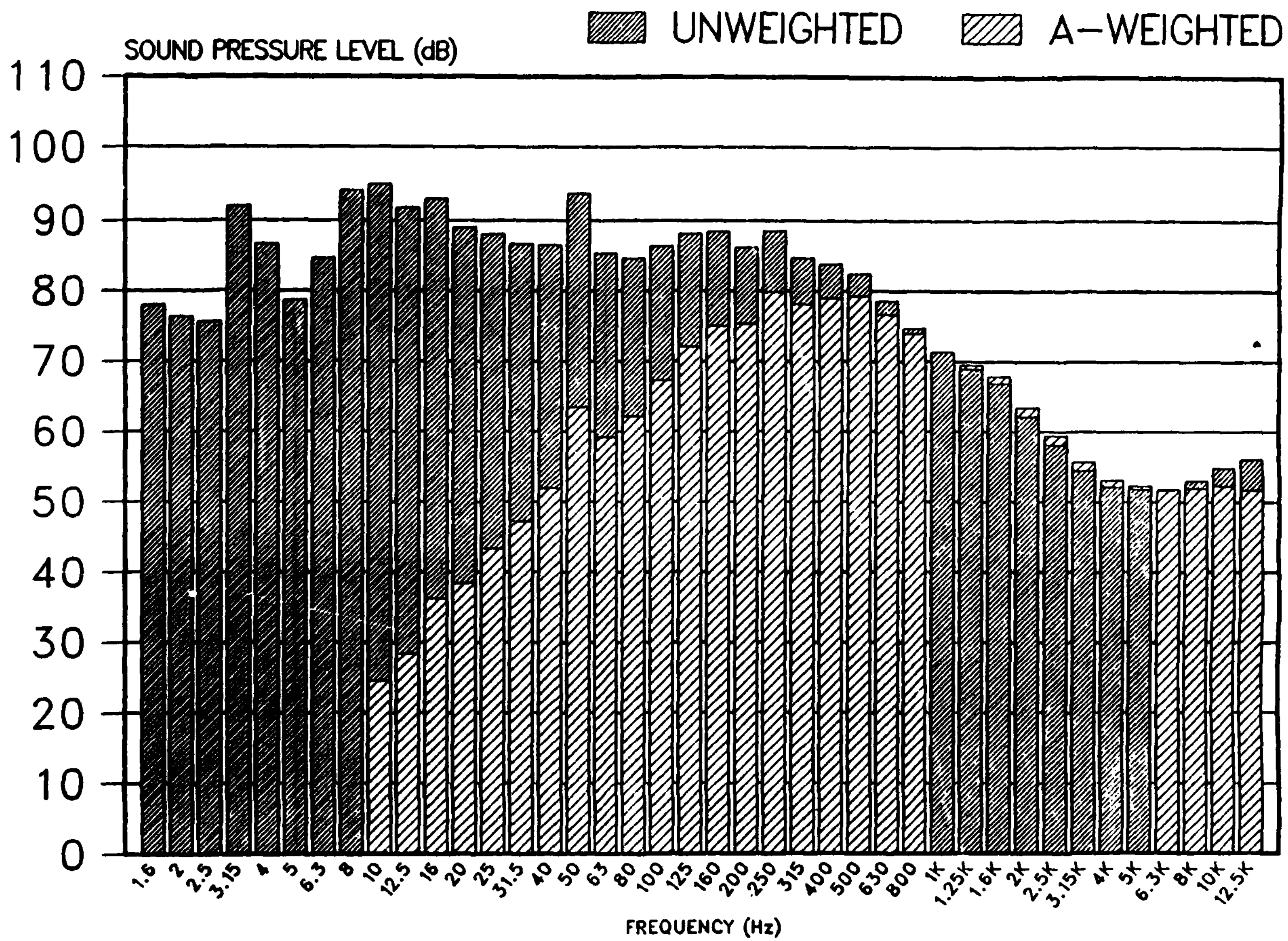


TABLE D-2: MEASURED SPECTRUM LEVELS
LOCATION: COOLING TOWER AIR EXHAUST VALVE CHAMBER.
POSITION: STATION 1
CONDITION: 2 FANS

FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	83.6	0.0	0.0			
2	82.2	0.0	0.0	87.0	0.0	0.0
2.5	80.3	0.0	0.0			
3.15	95.5	0.0	0.0			
4	90.2	0.0	0.0	96.8	0.0	0.0
5	83.8	0.0	0.0			
6.3	86.7	0.0	0.0			
8	93.1	0.0	0.0	98.1	25.6	81.7
10	96.0	25.6	81.7			
12.5	92.6	29.2	81.4			
16	95.2	38.5	86.7	98.9	45.1	91.0
20	94.4	43.9	88.2			
25	98.6	53.9	94.2			
31.5	92.1	52.7	89.1	99.8	58.4	95.9
40	88.8	54.2	86.8			
50	91.1	60.9	89.8			
63	88.5	62.3	87.7	94.0	67.6	93.0
80	87.1	64.6	86.6			
100	87.0	67.9	86.7			
125	88.7	72.6	88.5	93.1	77.8	92.9
160	89.0	75.6	88.9			
200	89.1	78.2	89.1			
250	90.2	81.6	90.2	93.8	85.1	93.8
315	87.1	80.5	87.1			
400	86.2	81.4	86.2			
500	85.3	82.1	85.3	89.6	86.0	89.6
630	81.8	79.9	81.8			
800	78.3	77.5	78.3			
1000	75.4	75.4	75.4	80.9	80.6	80.9
1250	73.1	73.7	73.1			
1600	71.0	72.0	70.9			
2000	67.3	68.5	67.1	73.1	74.2	72.9
2500	64.0	65.3	63.7			
3150	62.1	63.3	61.6			
4000	60.3	61.3	59.5	66.2	67.2	65.4
5000	61.8	62.3	60.5			
6300	61.8	61.7	59.8			
8000	62.4	61.3	59.4	67.6	66.3	64.4
10000	64.0	61.5	59.6			
12500	65.4	61.1	59.2			

OVERALL LEVELS (1.6 - 12500 Hz)

OASPL = 105.7 dB OASLA = 89.7 dB(A)

OASLC = 101.0 dB(C) C-A VALUE = +11.3

FIGURE D–2: COOLING TOWER AIR EXHAUST VALVE CHAMBER
STATION 1 – 2 FANS OPERATING

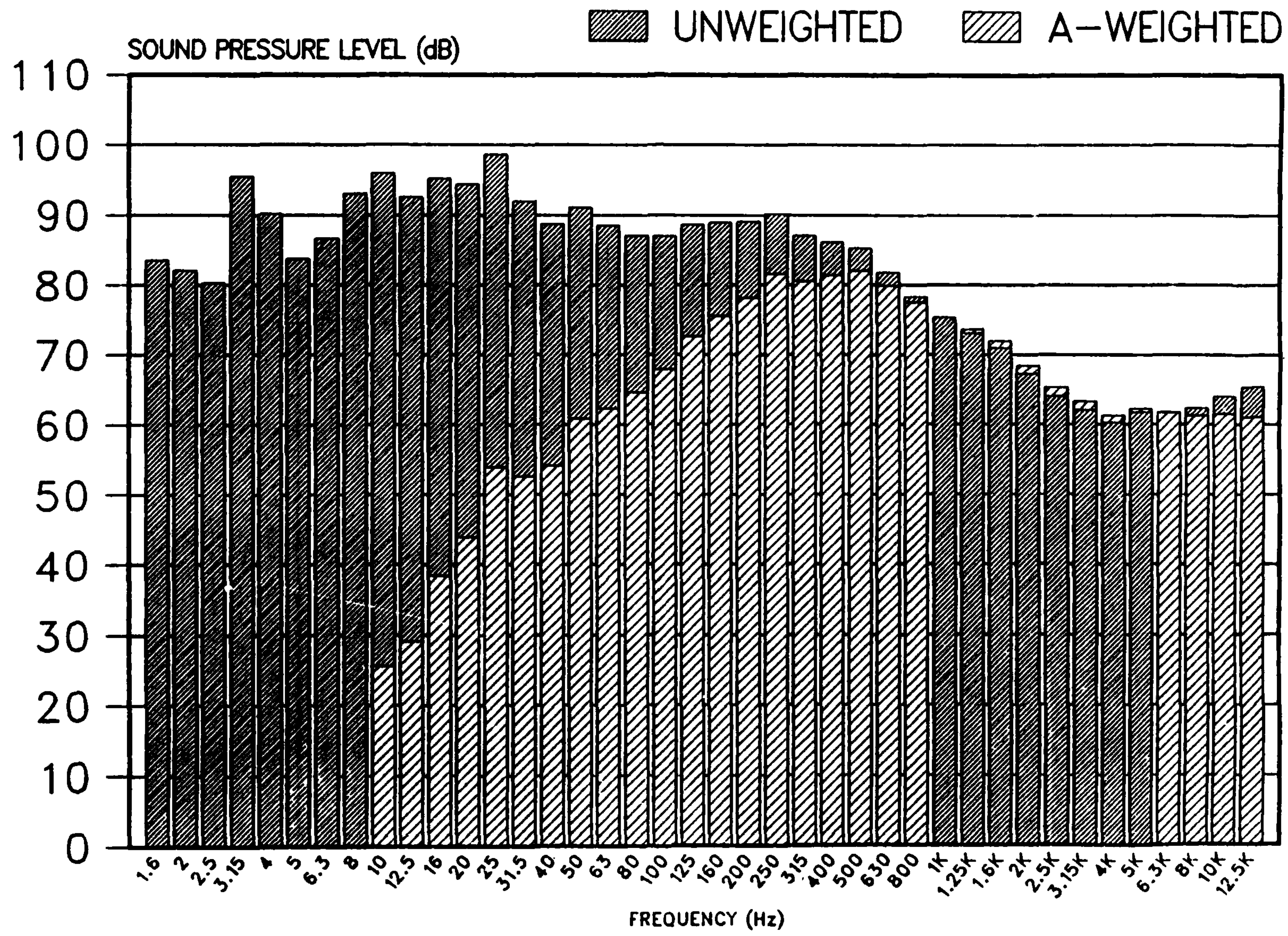


TABLE D-3: MEASURED SOECTRUM LEVELS.
LOCATION: COOLING TOWER AIR EXHAUST VALVE CHAMBER
POSITION: STATION 1
CONDITION: 3 FANS

FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	89.1	0.0	0.0			
2	84.7	0.0	0.0	91.4	0.0	0.0
2.5	84.6	0.0	0.0			
3.15	98.7	0.0	0.0			
4	93.7	0.0	0.0	100.0	0.0	0.0
5	86.3	0.0	0.0			
6.3	89.1	0.0	0.0			
8	92.7	0.0	0.0	97.5	24.3	80.4
10	94.7	24.3	80.4			
12.5	91.5	28.1	80.3			
16	96.5	39.8	88.0	102.0	50.0	95.0
20	100.0	49.5	93.8			
25	108.0	63.3	103.6			
31.5	94.9	55.5	91.9	108.3	64.9	104.1
40	92.5	57.9	90.5			
50	95.4	65.2	94.1			
63	91.5	65.3	90.7	97.5	70.4	96.4
80	88.7	66.2	88.2			
100	88.8	69.7	88.5			
125	90.1	74.0	89.9	94.6	79.2	94.4
160	90.3	76.9	90.2			
200	90.2	79.3	90.2			
250	91.8	83.2	91.8	95.2	86.6	95.2
315	88.6	82.0	88.6			
400	87.6	82.8	87.6			
500	86.6	83.4	86.6	90.9	87.4	90.9
630	83.2	81.3	83.2			
800	79.9	79.1	79.9			
1000	76.8	76.8	76.8	82.3	82.0	82.3
1250	74.2	74.8	74.2			
1600	72.1	73.1	72.0			
2000	68.3	69.5	68.1	74.1	75.2	74.0
2500	64.7	66.0	64.4			
3150	62.1	63.3	61.6			
4000	60.3	61.3	59.5	66.2	67.2	65.4
5000	61.8	62.3	60.5			
6300	61.8	61.7	59.8			
8000	62.4	61.3	59.4	67.6	66.3	64.4
10000	64.0	61.5	59.6			
12500	65.4	61.1	59.2			

OVERALL LEVELS (1.6 - 12500 Hz)

OASPL = 110.6 dB   OASLA = 91.1 dB(A)

OASLC = 106.1 dB(C)   C-A VALUE = + 15.0

FIGURE D-3: COOLING TOWER AIR EXHAUST VALVE CHAMBER
STATION 1 - 3 FANS OPERATING

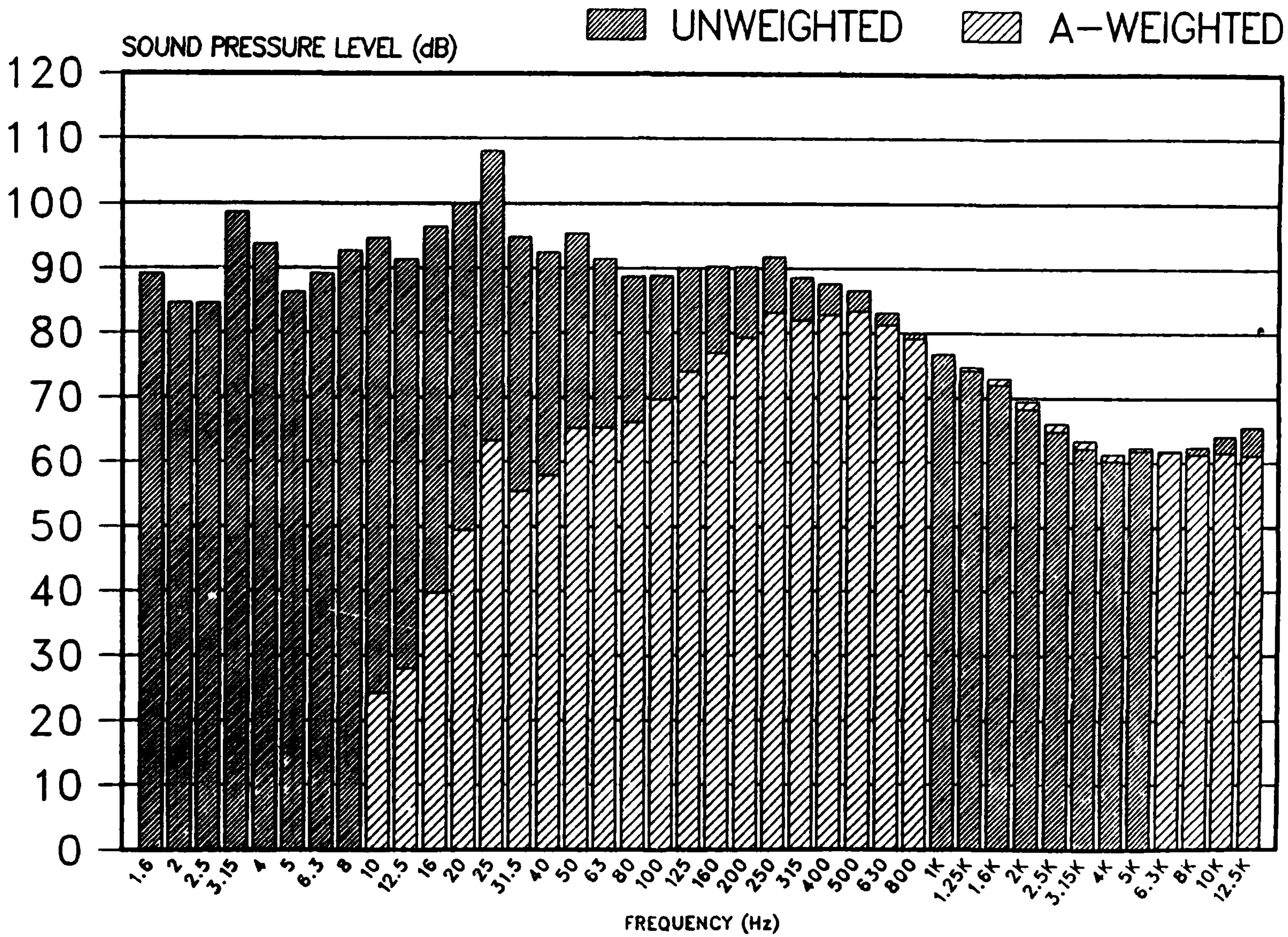


TABLE D-4: MEASURED SPECTRUM LEVELS.
LOCATION: COOLING TOWER AIR EXHAUST VALVE CHAMBER
POSITION: STATION 1
CONDITION: 4 FANS

FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	89.8	0.0	0.0			
2	86.9	0.0	0.0	93.0	0.0	0.0
2.5	87.3	0.0	0.0			
3.15	100.6	0.0	0.0			
4	95.4	0.0	0.0	102.0	0.0	0.0
5	89.9	0.0	0.0			
6.3	93.3	0.0	0.0			
8	93.6	0.0	0.0	99.3	25.6	81.7
10	96.0	25.6	81.7			
12.5	93.3	29.9	82.1			
16	97.1	40.4	88.6	103.0	50.9	95.9
20	101.0	50.5	94.8			
25	110.4	65.7	106.0			
31.5	95.3	55.9	92.3	110.6	66.8	106.3
40	92.8	58.2	90.8			
50	95.5	65.3	94.2			
63	92.7	66.5	91.9	98.0	71.0	96.9
80	89.3	66.8	88.8			
100	90.0	70.9	89.7			
125	91.1	75.0	90.9	95.7	80.3	95.5
160	91.4	78.0	91.3			
200	90.9	80.0	90.9			
250	93.1	84.5	93.1	96.2	87.5	96.2
315	89.3	82.7	89.3			
400	87.9	83.1	87.9			
500	87.2	84.0	87.2	91.4	87.9	91.4
630	83.8	81.9	83.8			
800	80.6	79.8	80.6			
1000	77.8	77.8	77.8	83.2	82.8	83.2
1250	75.1	75.7	75.1			
1600	73.0	74.0	72.9			
2000	69.2	70.4	69.0	75.0	76.1	74.9
2500	65.9	67.2	65.6			
3150	63.2	64.4	62.7			
4000	61.3	62.3	60.5	67.0	67.9	66.1
5000	61.8	62.3	60.5			
6300	61.8	61.7	59.8			
8000	63.0	61.9	60.0	68.0	66.6	64.7
10000	64.4	61.9	60.0			
12500	65.7	61.4	59.5			

*****OVERALL LEVELS (1.6 - 12500 Hz)*****

OASPL = 112.5 dB   **OASLA = 91.9 (A)**
OASLC = 107.8 dB(C)   **C-A VALUE = +15.9**

FIGURE D–4: COOLING TOWER AIR EXHAUST VALVE CHAMBER
STATION 1 – 4 FANS OPERATING

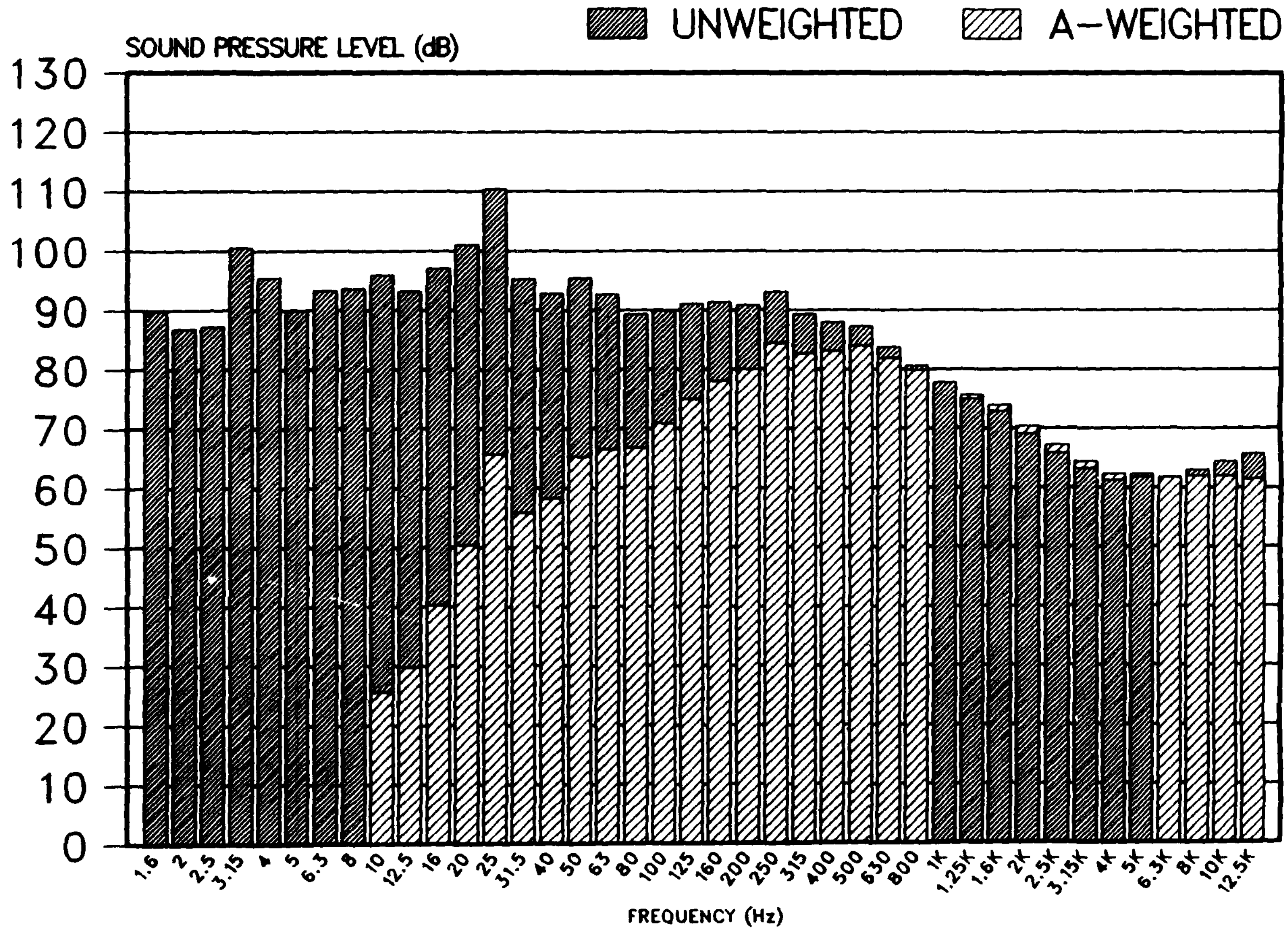


TABLE D-5: MEASURED SPECTRUM LEVELS.
LOCATION: COOLING TOWER AIR EXHAUST VALVE CHAMBER
POSITION: STATION 1
CONDITION: 5 FANS

FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	88.8	0.0	0.0			
2	85.7	0.0	0.0	91.7	0.0	0.0
2.5	85.3	0.0	0.0			
3.15	99.2	0.0	0.0			
4	94.1	0.0	0.0	100.5	0.0	0.0
5	87.0	0.0	0.0			
6.3	92.1	0.0	0.0			
8	93.5	0.0	0.0	99.5	26.6	82.7
10	97.0	26.6	82.7			
12.5	93.2	29.8	82.0			
16	97.9	41.2	89.4	104.4	52.7	97.6
20	102.9	52.4	96.7			
25	111.8	67.1	107.4			
31.5	95.3	55.9	92.3	112.0	68.0	107.6
40	93.7	59.1	91.7			
50	96.2	66.0	94.9			
63	93.3	67.1	92.5	98.7	71.8	97.7
80	90.3	67.8	89.8			
100	90.6	71.5	90.3			
125	92.0	75.9	91.8	96.4	81.0	96.2
160	92.0	78.6	91.9			
200	92.0	81.1	92.0			
250	94.0	85.4	94.0	97.1	88.5	97.1
315	90.2	83.6	90.2			
400	89.2	84.4	89.2			
500	88.4	85.2	88.4	92.6	89.0	92.6
630	84.8	82.9	84.8			
800	81.5	80.7	81.5			
1000	78.6	78.6	78.6	84.0	83.7	84.0
1250	76.0	76.6	76.0			
1600	73.8	74.8	73.7			
2000	69.9	71.1	69.7	75.8	76.8	75.6
2500	66.3	67.6	66.0			
3150	63.7	64.9	63.2			
4000	61.3	62.3	60.5	67.2	68.1	66.4
5000	61.8	62.3	60.5			
6300	61.8	61.7	59.8			
8000	63.0	61.9	60.0	68.2	66.8	64.9
10000	64.8	62.3	60.4			
12500	65.7	61.4	59.5			

*** OVERALL LEVELS (1.6 - 12500 Hz)***

OASPL = 113.5 dB　　OASLA = 92.9 dB(A)

OASLC = 109.1 dB(C)　　C-A VALUE = +16.2

FIGURE D-5: COOLING TOWER AIR EXHAUST VALVE CHAMBER STATION 1 – 5 FANS OPERATING

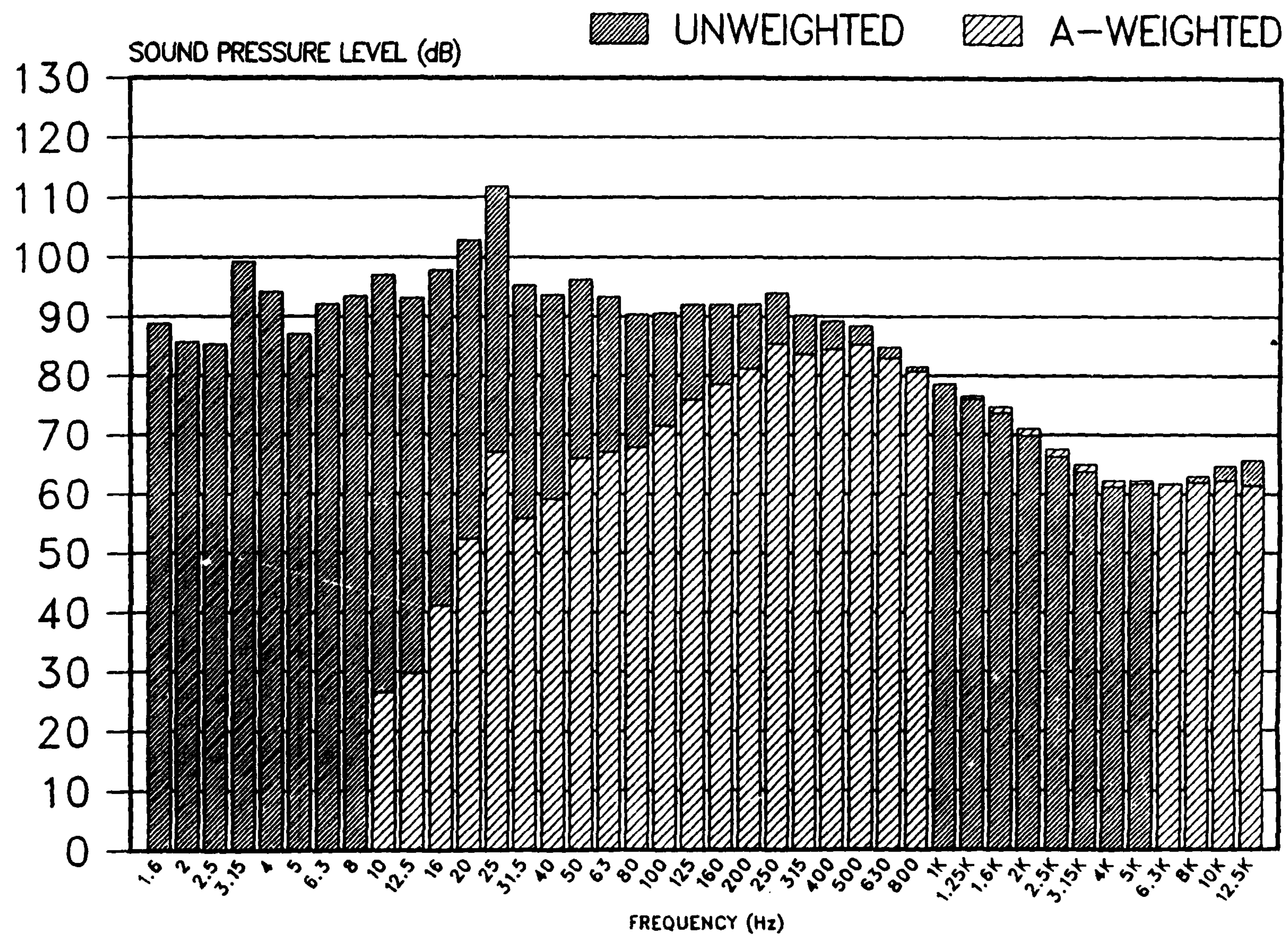


TABLE D-6: MEASURED SPECTRUM LEVELS.
LOCATION: COOLING TOWER AIR EXHAUST VALVE CHAMBER
POSITION: STATION 2
CONDITION: 5 FANS

FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	89.9	0.0	0.0			
2	91.4	0.0	0.0	95.9	0.0	0.0
2.5	92.0	0.0	0.0			
3.15	93.5	0.0	0.0			
4	84.6	0.0	0.0	95.0	0.0	0.0
5	88.1	0.0	0.0			
6.3	84.5	0.0	0.0			
8	95.4	0.0	0.0	98.6	25.1	81.2
10	95.5	25.1	81.2			
12.5	92.9	29.5	81.7			
16	92.5	35.8	84.0	102.4	51.1	95.7
20	101.4	50.9	95.2			
25	109.0	64.3	104.6			
31.5	93.4	54.0	90.4	109.2	65.4	104.9
40	91.6	57.0	89.6			
50	96.8	66.6	95.5			
63	91.8	65.6	91.0	98.5	71.0	97.4
80	89.0	66.5	88.5			
100	89.4	70.3	89.1			
125	88.5	72.4	88.3	93.6	77.8	93.4
160	88.5	75.1	88.4			
200	88.7	77.8	88.7			
250	90.4	81.8	90.4	93.5	84.7	93.5
315	85.9	79.3	85.9			
400	84.3	79.5	84.3			
500	83.0	79.8	83.0	87.4	83.7	87.4
630	78.9	77.0	78.9			
800	75.1	74.3	75.1			
1000	72.0	72.0	72.0	77.5	77.1	77.5
1250	68.7	69.3	68.7			
1600	67.3	68.3	67.2			
2000	63.7	64.9	63.5	69.6	70.6	69.4
2500	61.4	62.7	61.1			
3150	59.7	60.9	59.2			
4000	60.3	61.3	59.5	65.5	66.3	64.5
5000	61.8	62.3	60.5			
6300	61.8	61.7	59.8			
8000	62.4	61.3	59.4	67.8	66.4	64.5
10000	64.4	61.9	60.0			
12500	65.4	61.1	59.2			

OVERALL LEVELS (1.6 - 12500 Hz)

OASPL = 111.0 dB OASLA = 88.3 dB(A)

OASLC = 106.6 dB(C) C-A VALUE = +18.3

FIGURE D–6: COOLING TOWER AIR EXHAUST VALVE CHAMBER
STATION 2 – 5 FANS OPERATING

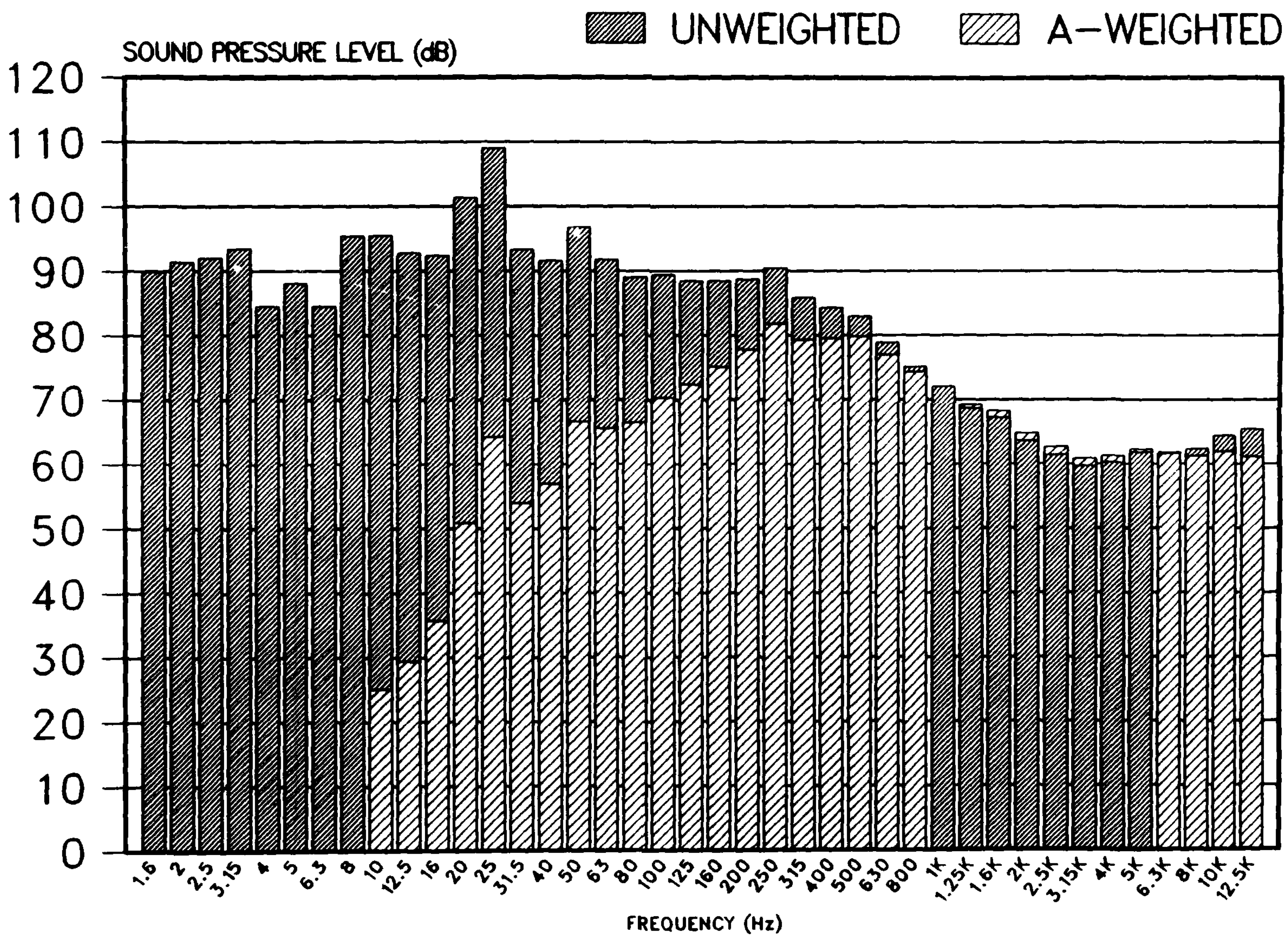


TABLE D-7: MEASURED SPECTRUM LEVELS.
LOCATION: COOLING TOWER AIR EXHAUST SHAFT
POSITION: STATION 3
CONDITION: 1 FAN

FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	82.5	0.0	0.0			
2	89.7	0.0	0.0	93.5	0.0	0.0
2.5	90.6	0.0	0.0			
3.15	91.8	0.0	0.0			
4	94.4	0.0	0.0	96.8	0.0	0.0
5	87.4	0.0	0.0			
6.3	98.6	0.0	0.0			
8	96.4	0.0	0.0	103.2	29.3	85.4
10	99.7	29.3	85.4			
12.5	93.9	30.5	82.7			
16	99.1	42.4	90.6	100.9	45.4	92.4
20	92.6	42.1	86.4			
25	89.9	45.2	85.5			
31.5	88.9	49.5	85.9	93.2	53.8	89.8
40	85.3	50.7	83.3			
50	93.2	63.0	91.9			
63	88.4	62.2	87.6	95.3	68.6	94.3
80	88.0	65.5	87.5			
100	91.0	71.9	90.7			
125	94.5	78.4	94.3	98.2	82.9	98.0
160	93.9	80.5	93.8			
200	93.4	82.5	93.4			
250	96.9	88.3	96.9	99.9	91.5	99.9
315	94.1	87.5	94.1			
400	93.9	89.1	93.9			
500	93.2	90.0	93.2	97.6	94.1	97.6
630	90.6	88.7	90.6			
800	87.7	86.9	87.7			
1000	85.4	85.4	85.4	90.7	90.5	90.7
1250	83.8	84.4	83.8			
1600	82.5	83.5	82.4			
2000	79.2	80.4	79.0	84.7	85.8	84.6
2500	75.9	77.2	75.6			
3150	72.1	73.3	71.6			
4000	68.7	69.7	67.9	74.3	75.4	73.7
5000	65.4	65.9	64.1			
6300	63.0	62.9	61.0			
8000	62.4	61.3	59.4	68.0	66.7	64.8
10000	64.0	61.5	59.6			
12500	65.4	61.1	59.2			

OVERALL LEVELS (1.6 - 12500 Hz)

OASPL = 108.4 dB   OASLA = 97.6 dB(A)

OASLC = 104.6 dB(C)   C-A VALUE = +7.0

FIGURE D–7: COOLING TOWER AIR EXHAUST VALVE CHAMBER
STATION 3 – 1 FAN OPERATING

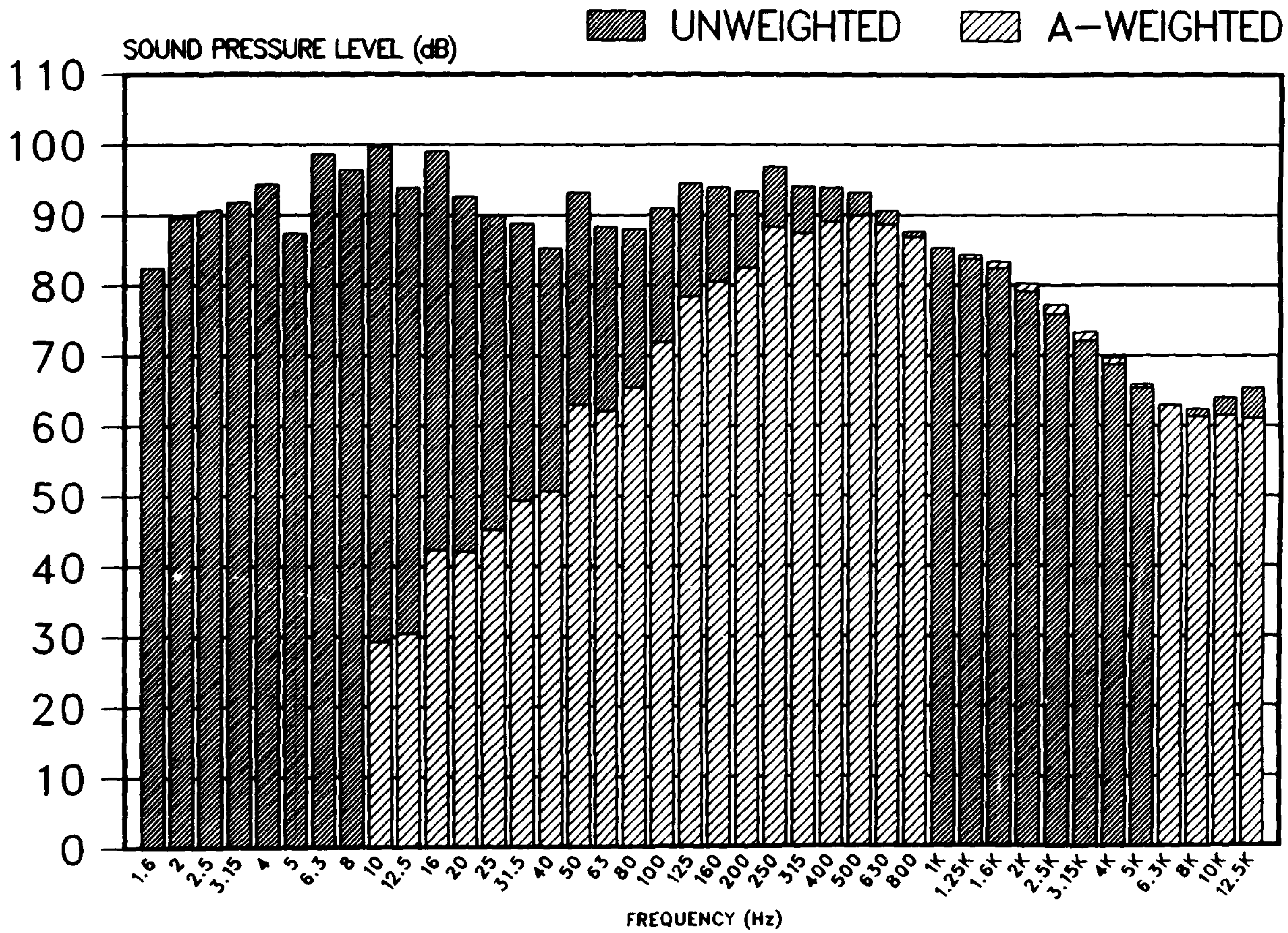


TABLE D-8: MEASURED SPECTRUM LEVELS.
LOCATION: COOLING TOWER AIR EXHAUST SHAFT
POSITION: STATION 3
CONDITION: 2 FANS

FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	90.9	0.0	0.0			
2	92.3	0.0	0.0	98.6	0.0	0.0
2.5	96.4	0.0	0.0			
3.15	96.2	0.0	0.0			
4	98.0	0.0	0.0	101.0	0.0	0.0
5	93.1	0.0	0.0			
6.3	100.4	0.0	0.0			
8	95.1	0.0	0.0	103.8	29.5	85.6
10	99.9	29.5	85.6			
12.5	94.6	31.2	83.4			
16	100.0	43.3	91.5	102.4	47.9	94.3
20	96.5	46.0	90.3			
25	99.6	54.9	95.2			
31.5	94.4	55.0	91.4	101.0	59.5	97.1
40	89.0	54.4	87.0			
50	91.8	61.6	90.5			
63	89.6	63.4	88.8	95.7	70.3	94.8
80	91.0	68.5	90.5			
100	91.9	72.8	91.6			
125	95.8	79.7	95.6	99.5	84.4	99.3
160	95.5	82.1	95.4			
200	95.6	84.7	95.6			
250	98.6	90.0	98.6	101.8	93.5	101.8
315	96.3	89.7	96.3			
400	96.1	91.3	96.1			
500	95.9	92.7	95.9	100.1	96.7	100.1
630	93.6	91.7	93.6			
800	91.1	90.3	91.1			
1000	89.0	89.0	89.0	94.2	94.0	94.2
1250	87.4	88.0	87.4			
1600	86.0	87.0	85.9			
2000	82.8	84.0	82.6	88.3	89.4	88.1
2500	79.7	81.0	79.4			
3150	76.0	77.2	75.5			
4000	72.3	73.3	71.5	78.0	79.1	77.4
5000	68.4	68.9	67.1			
6300	64.8	64.7	62.8			
8000	63.5	62.4	60.5	69.0	68.0	66.1
10000	64.4	61.9	60.0			
12500	65.4	61.1	59.2			

OVERALL LEVELS (1.6 - 12500 Hz)*

OASPL = 110.6 dB OASLA = 100.3 dB(A)

OASLC = 106.9 dB(C) C-A VALUE = + 6.6

FIGURE D–8: COOLING TOWER AIR EXHAUST SHAFT
STATION 3 – 2 FANS OPERATING

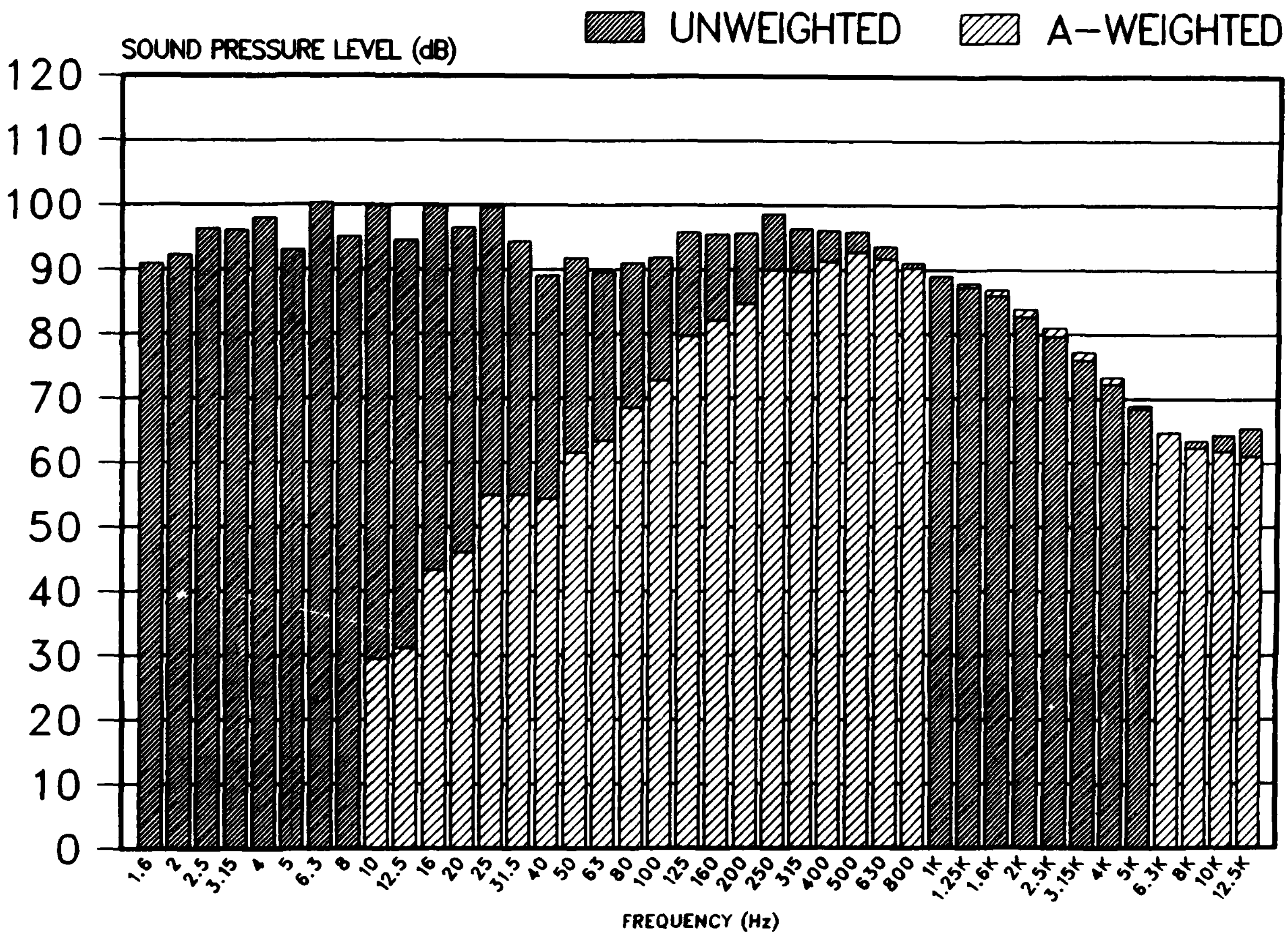


TABLE D-9: MEASURED SPECTRUM LEVELS.
LOCATION: COOLING TOWER AIR EXHAUST SHAFT
POSITION: STATION 3
CONDITION: 3 FANS

FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	96.0	0.0	0.0			
2	98.7	0.0	0.0	102.2	0.0	0.0
2.5	97.1	0.0	0.0			
3.15	101.3	0.0	0.0			
4	103.1	0.0	0.0	105.9	0.0	0.0
5	96.8	0.0	0.0			
6.3	101.8	0.0	0.0			
8	96.9	0.0	0.0	104.5	28.7	84.8
10	99.1	28.7	84.8			
12.5	93.9	30.5	82.7			
16	102.6	45.9	94.1	106.8	54.6	99.7
20	104.4	53.9	98.2			
25	113.9	69.2	109.5			
31.5	96.7	57.3	93.7	114.0	69.8	109.7
40	92.5	57.9	90.5			
50	95.3	65.1	94.0			
63	95.2	69.0	94.4	99.4	73.6	98.5
80	93.2	70.7	92.7			
100	94.6	75.5	94.3			
125	97.3	81.2	97.1	101.1	85.8	100.9
160	96.7	83.3	96.6			
200	96.7	85.8	96.7			
250	99.7	91.1	99.7	103.0	94.7	103.0
315	97.6	91.0	97.6			
400	97.4	92.6	97.4			
500	97.3	94.1	97.3	101.5	98.2	101.5
630	95.3	93.4	95.3			
800	92.5	91.7	92.5			
1000	90.4	90.4	90.4	95.6	95.3	95.6
1250	88.7	89.3	88.7			
1600	87.2	88.2	87.1			
2000	84.1	85.3	83.9	89.6	90.7	89.4
2500	81.1	82.4	80.8			
3150	77.7	78.9	77.2			
4000	74.2	75.2	73.4	79.8	80.9	79.1
5000	70.2	70.7	68.9			
6300	66.3	66.2	64.3			
8000	64.4	63.3	61.4	70.2	69.2	67.3
10000	65.4	62.9	61.0			
12500	66.5	62.2	60.3			

OVERALL LEVELS (1.6 - 12500 Hz)

OASPL = 116.5 dB   OASLA = 101.7 dB(A)

OASLC = 112.0 dB(C)   C-A VALUE = + 10.3

FIGURE D–9: COOLING TOWER AIR EXHAUST SHAFT
STATION 3 – 3 FANS OPERATING

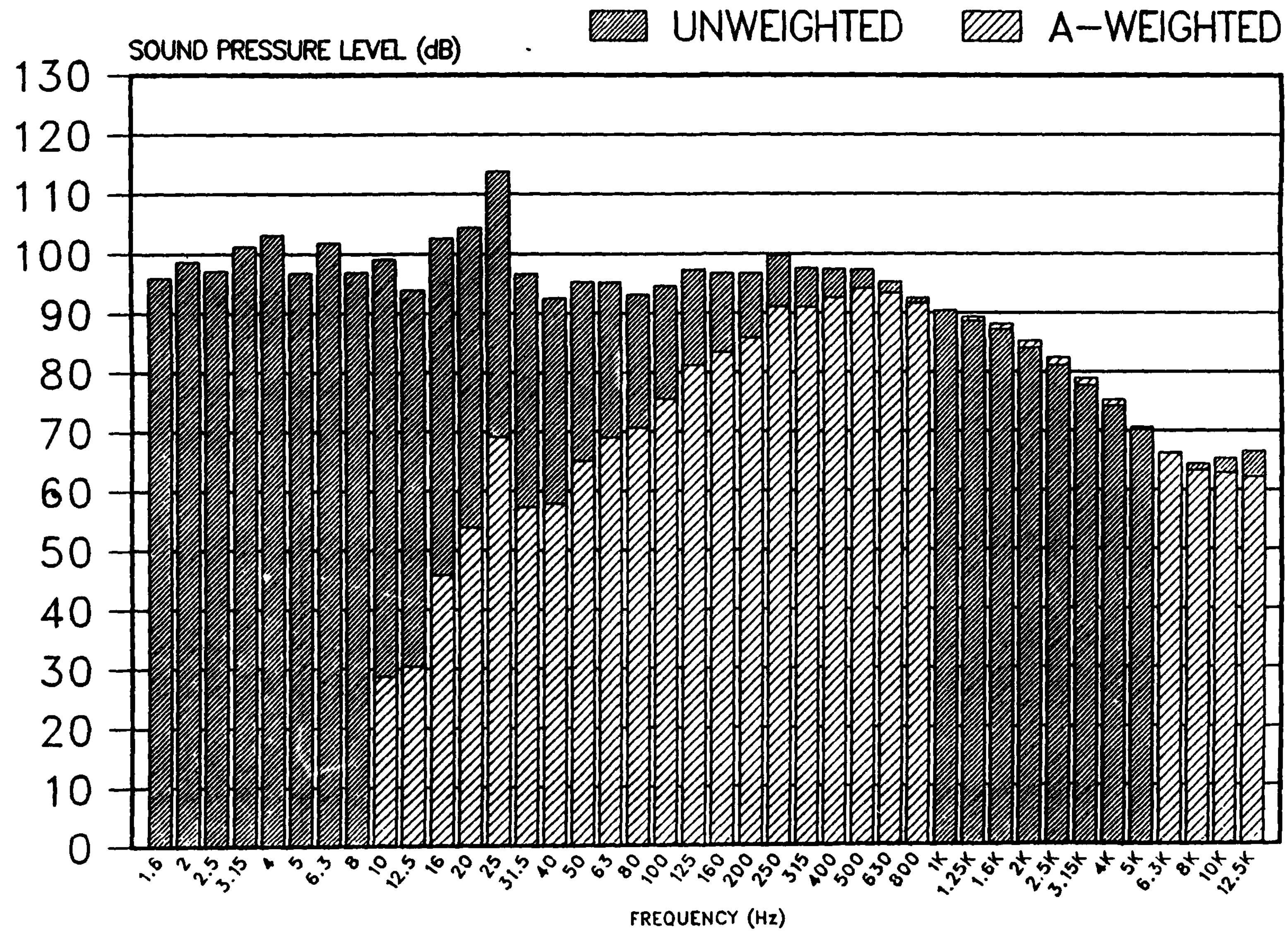


TABLE D-10: MEASURED SPECTRUM LEVELS.
LOCATION: COOLING TOWER AIR EXHAUST SHAFT
POSITION: STATION 3
CONDITION: 4 FANS

FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	96.3	0.0	0.0			
2	98.7	0.0	0.0	104.3	0.0	0.0
2.5	101.8	0.0	0.0			
3.15	102.1	0.0	0.0			
4	103.3	0.0	0.0	106.7	0.0	0.0
5	99.5	0.0	0.0			
6.3	105.1	0.0	0.0			
8	98.1	0.0	0.0	106.8	29.4	85.5
10	99.8	29.4	85.5			
12.5	94.9	31.5	83.7			
16	102.5	45.8	94.0	106.2	53.6	99.0
20	103.3	52.8	97.1			
25	111.9	67.2	107.5			
31.5	98.1	58.7	95.1	112.1	68.4	107.9
40	94.1	59.5	92.1			
50	97.2	67.0	95.9			
63	96.3	70.1	95.5	100.8	74.8	99.9
80	94.2	71.7	93.7			
100	94.9	75.8	94.6			
125	97.6	81.5	97.4	101.5	86.2	101.3
160	97.2	83.8	97.1			
200	97.8	86.9	97.8			
250	101.1	92.5	101.1	104.1	95.7	104.1
315	98.2	91.6	98.2			
400	97.7	92.9	97.7			
500	97.8	94.6	97.8	101.9	98.6	101.9
630	95.7	93.8	95.7			
800	93.0	92.2	93.0			
1000	91.0	91.0	91.0	96.1	95.9	96.1
1250	89.4	90.0	89.4			
1600	87.8	88.8	87.7			
2000	84.8	86.0	84.6	90.2	91.3	90.1
2500	82.1	83.4	81.8			
3150	79.0	80.2	78.5			
4000	75.7	76.7	74.9	81.2	82.3	80.5
5000	71.9	72.4	70.6			
6300	67.6	67.5	65.6			
8000	64.8	63.7	61.8	70.9	70.0	68.1
10000	65.4	62.9	61.0			
12500	66.5	62.2	60.3			

OVERALL LEVELS (1.6 - 12500 Hz)

OASPL = 116.0 dB　　OASLA = 102.3 dB(A)

OASLC = 111.4 dB(C)　　C-A VALUE = + 9.1

FIGURE D–10: COOLING TOWER AIR EXHAUST SHAFT
STATION 3 – 4 FANS OPERATING

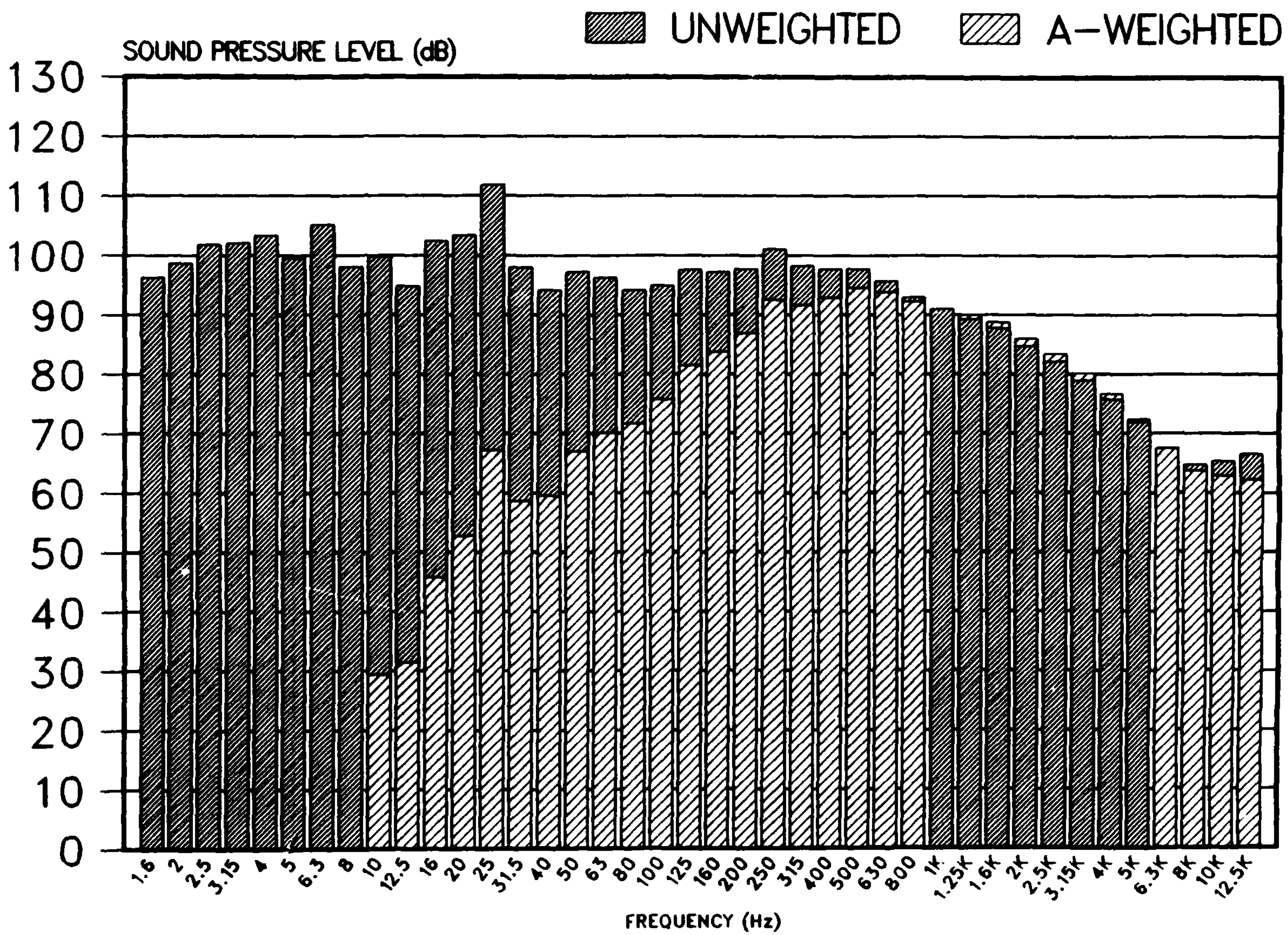


TABLE D-11: MEASURED SPECTRUM LEVELS
LOCATION: COOLING TOWER AIR EXHAUST SHAFT
POSITION: STATION 3
CONDITION: 5 FANS

FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	96.3	0.0	0.0			
2	98.9	0.0	0.0	103.4	0.0	0.0
2.5	100.0	0.0	0.0			
3.15	100.7	0.0	0.0			
4	103.7	0.0	0.0	105.9	0.0	0.0
5	95.5	0.0	0.0			
6.3	105.6	0.0	0.0			
8	99.0	0.0	0.0	107.4	30.0	86.1
10	100.4	30.0	86.1			
12.5	96.0	32.6	84.8			
16	103.3	46.6	94.8	106.2	52.8	98.6
20	102.1	51.6	95.9			
25	109.2	64.5	104.8			
31.5	97.9	58.5	94.9	109.6	66.3	105.4
40	93.4	58.8	91.4			
50	97.6	67.4	96.3			
63	96.7	70.5	95.9	101.3	75.3	100.4
80	94.9	72.4	94.4			
100	96.0	76.9	95.7			
125	98.2	82.1	98.0	102.3	87.0	102.1
160	98.1	84.7	98.0			
200	98.5	87.6	98.5			
250	102.1	93.5	102.1	104.9	96.5	104.9
315	98.8	92.2	98.8			
400	98.7	93.9	98.7			
500	98.6	95.4	98.6	102.7	99.3	102.7
630	96.1	94.2	96.1			
800	93.8	93.0	93.8			
1000	91.8	91.8	91.8	96.9	96.6	96.9
1250	89.9	90.5	89.9			
1600	88.4	89.4	88.3			
2000	85.2	86.4	85.0	90.8	91.9	90.6
2500	82.6	83.9	82.3			
3150	79.6	80.8	79.1			
4000	76.0	77.0	75.2	81.7	82.8	81.0
5000	72.1	72.6	70.8			
6300	67.8	67.7	65.8			
8000	64.8	63.7	61.8	71.0	70.1	68.2
10000	65.4	62.9	61.0			
12500	66.3	62.0	60.1			

OVERALL LEVELS (1.6 - 12500 Hz)
OASPL = 115.2 dB OASLA = 103.0 dB(A)
OASLC = 111.0 dB(C) C-A VALUE = +8.0

FIGURE D-11: COOLING TOWER AIR EXHAUST SHAFT STATION 3 – 5 FANS OPERATING

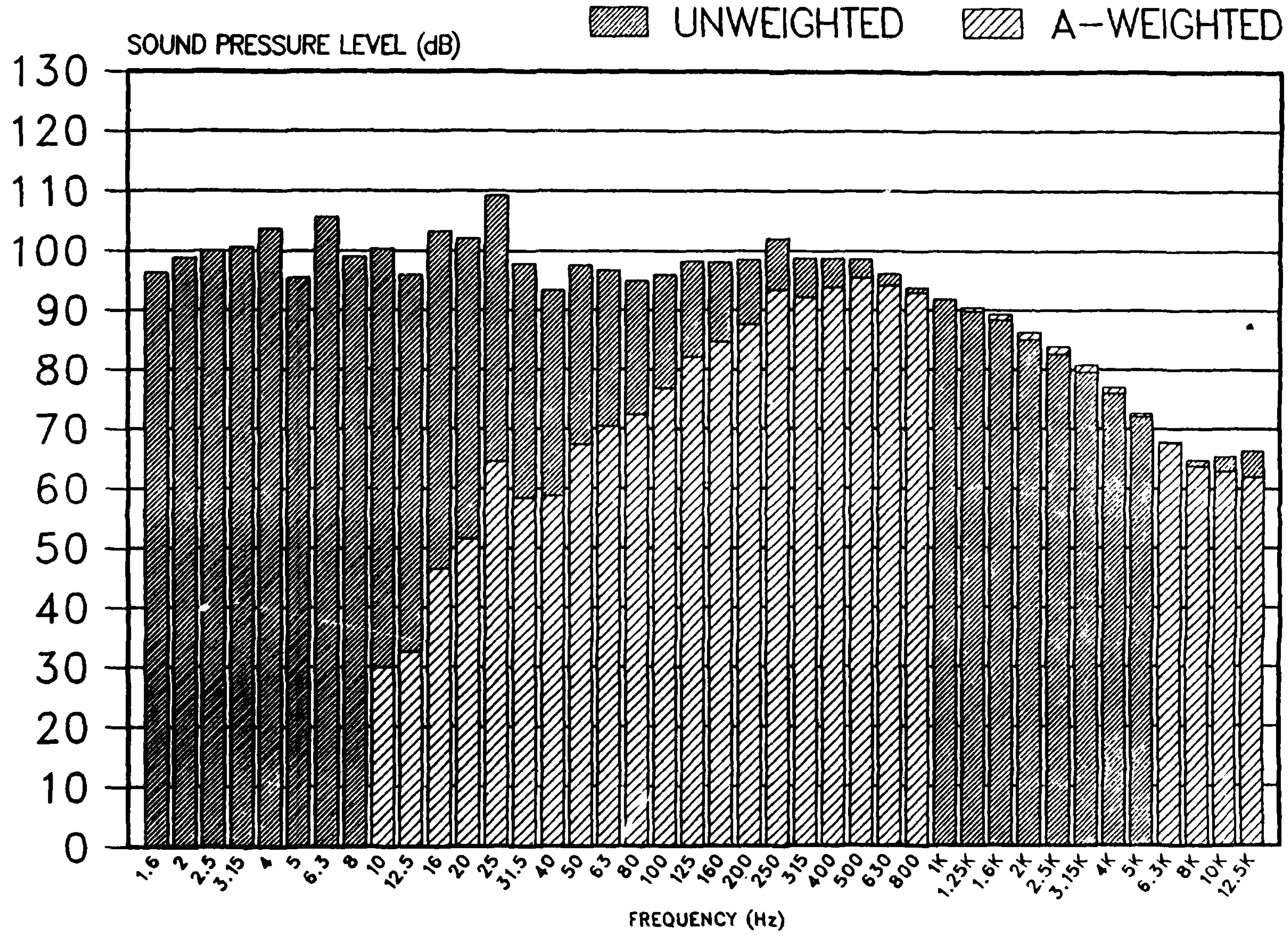


TABLE D-12: MEASURED SPECTRUM LEVELS.
LOCATION: COOLING TOWER PLATFORM CHAMBER
POSITION: STATION 4
CONDITION: 1 FAN

FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	67.5	0.0	0.0			
2	75.4	0.0	0.0	78.3	0.0	0.0
2.5	74.5	0.0	0.0			
3.15	71.5	0.0	0.0			
4	64.8	0.0	0.0	79.9	0.0	0.0
5	79.0	0.0	0.0			
6.3	79.3	0.0	0.0			
8	78.7	0.0	0.0	82.4	5.0	56.7
10	71.0	0.6	56.7			
12.5	74.4	11.0	63.2			
16	85.4	28.7	76.9	90.4	38.6	83.6
20	88.7	38.2	82.5			
25	95.8	51.1	91.4			
31.5	86.1	46.7	83.1	96.5	54.2	92.4
40	84.0	49.4	82.0			
50	87.8	57.6	86.5			
63	87.4	61.2	86.6	92.3	67.0	91.4
80	87.5	65.0	87.0			
100	86.4	67.3	86.1			
125	85.8	69.7	85.6	90.3	74.2	90.1
160	84.1	70.7	84.0			
200	83.1	72.2	83.1			
250	85.1	76.5	85.1	88.1	79.5	88.1
315	81.0	74.4	81.0			
400	80.5	75.7	80.5			
500	79.9	76.7	79.9	84.3	80.9	84.3
630	77.8	75.9	77.8			
800	75.5	74.7	75.5			
1000	74.6	74.6	74.6	79.2	79.0	79.2
1250	72.8	73.4	72.8			
1600	73.1	74.1	73.0			
2000	68.9	70.1	68.7	75.3	76.4	75.1
2500	67.7	69.0	67.4			
3150	66.6	67.8	66.1			
4000	65.6	66.6	64.8	70.3	71.3	69.5
5000	64.2	64.7	62.9			
6300	62.5	62.4	60.5			
8000	60.5	59.4	57.5	65.7	64.9	63.0
10000	59.1	56.6	54.7			
12500	57.8	53.5	51.6			

OVERALL LEVELS (1.6 - 12500 Hz)

OASPL = 99.9 dB   OASLA = 85.8 dB(A)

OASLC = 97.3 dB(C)   C-A VALUE= +11.5

FIGURE D-12: COOLING TOWER PLATFORM CHAMBER
STATION 4 - 1 FAN OPERATING

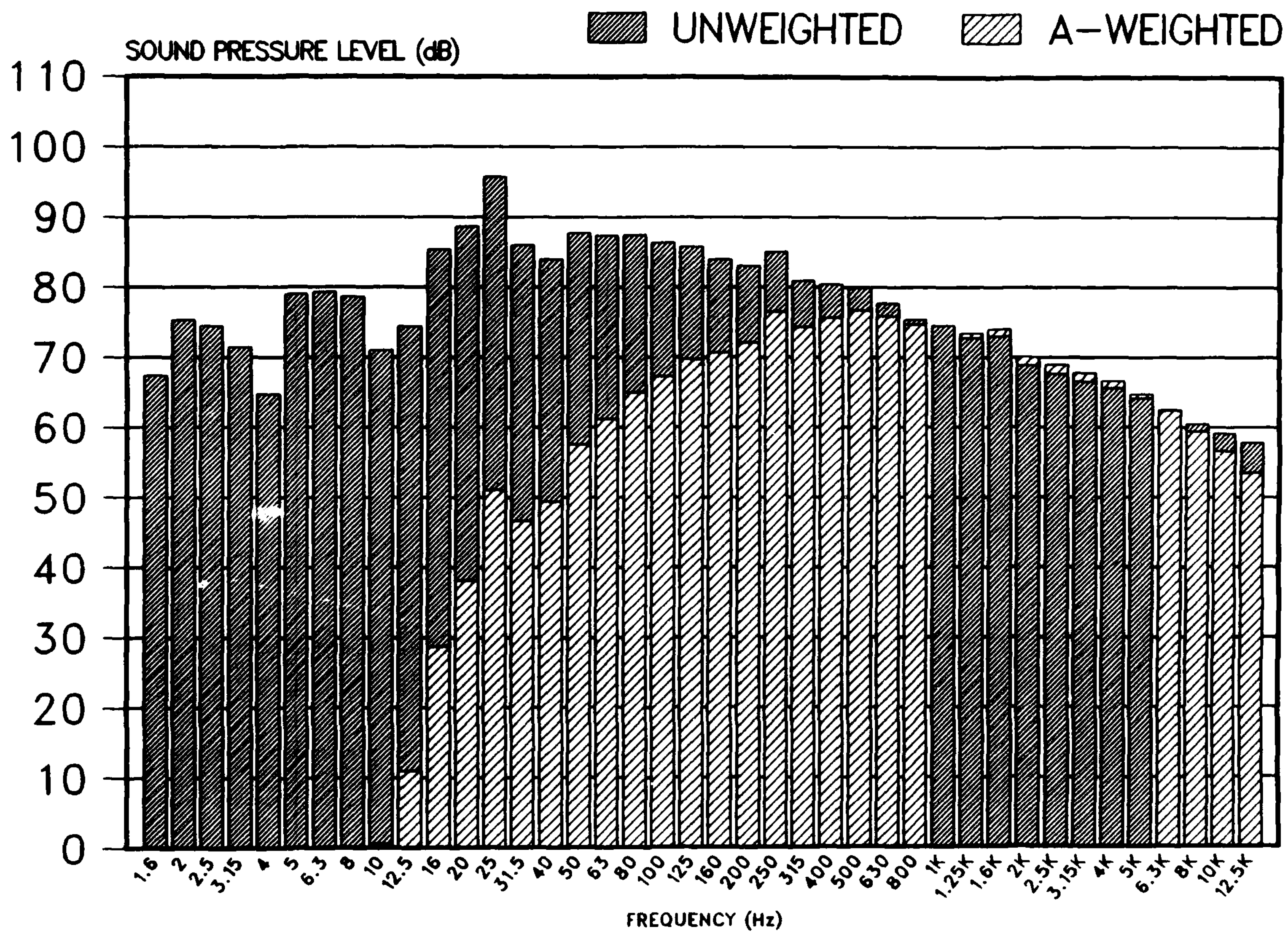


TABLE D-13: MEASURED SPECTRUM LEVELS
LOCATION: COOLING TOWER PLATFORM CHAMBER
POSITION: STATION 4
CONDITION: 2 FANS

FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	69.9	0.0	0.0			
2	79.9	0.0	0.0	82.3	0.0	0.0
2.5	78.1	0.0	0.0			
3.15	75.9	0.0	0.0			
4	68.0	0.0	0.0	85.1	0.0	0.0
5	84.5	0.0	0.0			
6.3	83.8	0.0	0.0			
8	83.0	0.0	0.0	87.0	8.7	63.4
10	77.7	7.3	63.4			
12.5	81.5	18.1	70.3			
16	84.5	27.8	76.0	92.0	40.5	85.2
20	90.7	40.2	84.5			
25	97.8	53.1	93.4			
31.5	89.2	49.8	86.2	98.7	56.7	94.6
40	86.8	52.2	84.8			
50	90.9	60.7	89.6			
63	89.7	63.5	88.9	95.4	70.3	94.5
80	91.1	68.6	90.6			
100	88.2	69.1	87.9			
125	86.5	70.4	86.3	91.7	75.5	91.5
160	85.6	72.2	85.5			
200	86.0	75.1	86.0			
250	88.5	79.9	88.5	91.3	82.6	91.3
315	83.6	77.0	83.6			
400	82.1	77.3	82.1			
500	81.4	78.2	81.4	86.1	82.7	86.1
630	80.2	78.3	80.2			
800	77.7	76.9	77.7			
1000	77.5	77.5	77.5	81.8	81.7	81.8
1250	75.6	76.2	75.6			
1600	76.2	77.2	76.1			
2000	72.9	74.1	72.7	78.8	79.9	78.6
2500	71.6	72.9	71.3			
3150	70.0	71.2	69.5			
4000	68.4	69.4	67.6	73.4	74.4	72.6
5000	67.0	67.5	65.7			
6300	65.1	65.0	63.1			
8000	64.0	62.9	61.0	69.3	68.2	66.3
10000	64.4	61.9	60.0			
12500	65.4	61.1	59.2			

OVERALL LEVELS (1.6 - 12500 Hz)

OASPL = 102.3 dB   OASLA = 88.4 dB(A)

OASLC = 99.8 dB(C)   C-A VALUE = +11.4

FIGURE D–13: COOLING TOWER PLATFORM CHAMBER
STATION 4 – 2 FANS OPERATING

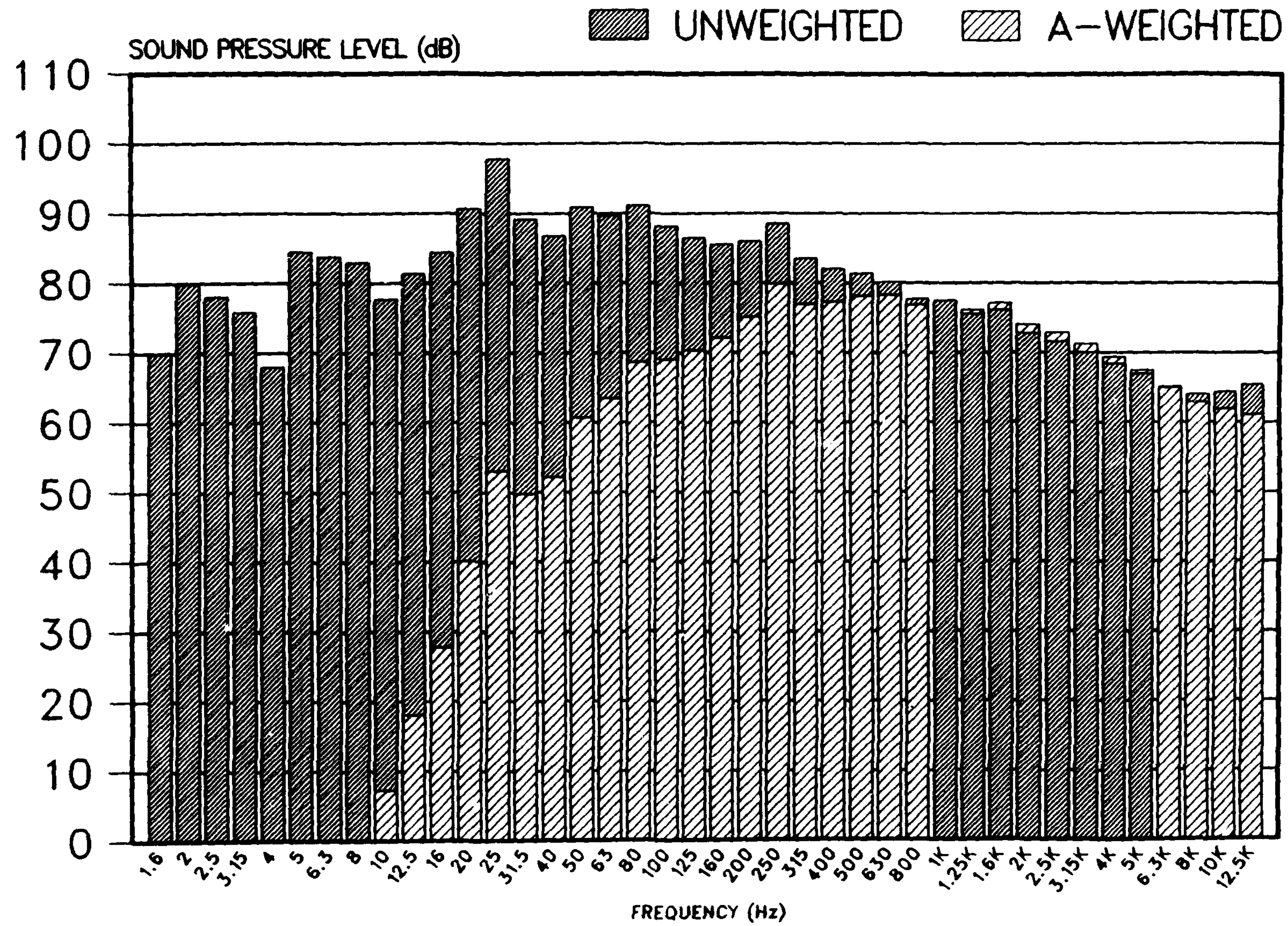


TABLE D-14: MEASURED SPECTRUM LEVELS.
LOCATION: COOLING TOWER PLATFORM CHEMBER
POSITION: STATION 4
CONDITION: 3 FANS

FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	74.3	0.0	0.0			
2	80.1	0.0	0.0	82.6	0.0	0.0
2.5	77.4	0.0	0.0			
3.15	77.5	0.0	0.0			
4	71.1	0.0	0.0	87.5	0.0	0.0
5	86.9	0.0	0.0			
6.3	86.1	0.0	0.0			
8	81.7	0.0	0.0	87.9	8.5	63.1
10	77.4	7.0	63.1			
12.5	81.4	18.0	70.2			
16	84.9	28.2	76.4	92.2	40.6	85.3
20	90.8	40.3	84.6			
25	99.0	54.3	94.6			
31.5	92.0	52.6	89.0	100.1	58.5	96.2
40	88.7	54.1	86.7			
50	92.9	62.7	91.6			
63	92.9	66.7	92.1	97.4	71.8	96.5
80	91.9	69.4	91.4			
100	89.2	70.1	88.9			
125	88.0	71.9	87.8	93.0	76.9	92.7
160	87.1	73.7	87.0			
200	87.8	76.9	87.8			
250	89.8	81.2	89.8	92.9	84.2	92.9
315	85.7	79.1	85.7			
400	84.6	79.8	84.6			
500	84.3	81.1	84.3	89.0	85.7	89.0
630	83.6	81.7	83.6			
800	80.2	79.4	80.2			
1000	79.9	79.9	79.9	84.3	84.1	84.3
1250	78.1	78.7	78.1			
1600	79.2	80.2	79.1			
2000	75.4	76.6	75.2	81.5	82.6	81.4
2500	74.1	75.4	73.8			
3150	72.8	74.0	72.3			
4000	70.9	71.9	70.1	76.1	77.1	75.3
5000	69.7	70.2	68.4			
6300	67.4	67.3	65.4			
8000	65.1	64.0	62.1	70.8	69.9	68.0
10000	65.1	62.6	60.7			
12500	65.4	61.1	59.2			

OVERALL LEVELS (1.6 - 12500 Hz)

OASPL = 103.8 dB   OASLA = 90.8 dB(A)

OASLC = 101.5 dB(C)   C-A VALUE = +10.7

FIGURE D–14: COOLING TOWER PLATFORM CHAMBER
STATION 4 – 3 FANS OPERATING

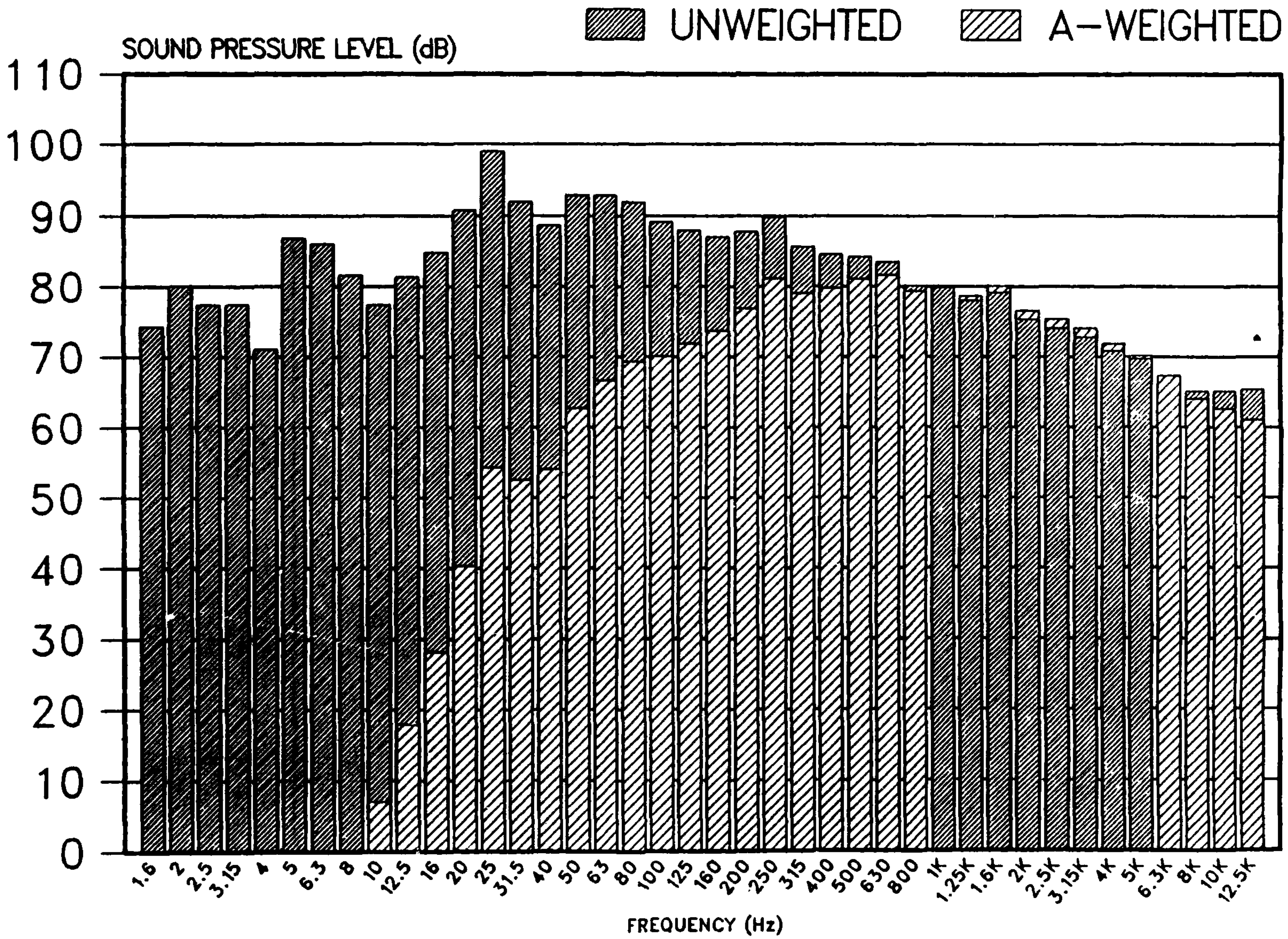


TABLE D-15: MEASURED SPECTRUM LEVELS.
LOCATION: COOLING TOWER PLATFORM CHAMBER
POSITION: STATION 4
CONDITION: 4 FANS

FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	79.3	0.0	0.0			
2	84.4	0.0	0.0	87.2	0.0	0.0
2.5	82.3	0.0	0.0			
3.15	80.0	0.0	0.0			
4	73.2	0.0	0.0	90.3	0.0	0.0
5	89.8	0.0	0.0			
6.3	86.1	0.0	0.0			
8	82.9	0.0	0.0	88.3	9.4	64.4
10	78.7	8.3	64.4			
12.5	83.0	19.6	71.8			
16	89.3	32.6	80.8	94.4	42.4	87.4
20	92.4	41.9	86.2			
25	100.8	56.1	96.4			
31.5	98.4	59.0	95.4	103.1	62.4	99.5
40	92.1	57.5	90.1			
50	94.1	63.9	92.8			
63	92.7	66.5	91.9	97.8	71.9	96.8
80	91.9	69.4	91.4			
100	90.3	71.2	90.0			
125	89.5	73.4	89.3	94.4	78.4	94.1
160	88.8	75.4	88.7			
200	89.8	78.9	89.8			
250	92.2	83.6	92.2	95.0	86.3	95.0
315	87.4	80.8	87.4			
400	86.4	81.6	86.4			
500	86.4	83.2	86.4	90.8	87.6	90.8
630	85.3	83.4	85.3			
800	82.6	81.8	82.6			
1000	82.6	82.6	82.6	86.9	86.8	86.9
1250	81.0	81.6	81.0			
1600	82.3	83.3	82.2			
2000	79.2	80.4	79.0	84.9	86.0	84.7
2500	77.7	79.0	77.4			
3150	77.1	78.3	76.6			
4000	75.4	76.4	74.6	80.4	81.4	79.6
5000	73.7	74.2	72.4			
6300	71.1	71.0	69.1			
8000	68.1	67.0	65.1	73.9	73.1	71.2
10000	67.0	64.5	62.6			
12500	66.5	62.2	60.3			

*** OVERALL LEVELS (1.6 - 12500 Hz)***

OASPL = 106.0 dB   OASLA = 93.3 dB(A)

OASLC = 103.4 dB(C)   C-A VALUE = +10.1

FIGURE D–15: COOLING TOWER PLATFORM CHAMBER
STATION 4 – 4 FANS OPERATING

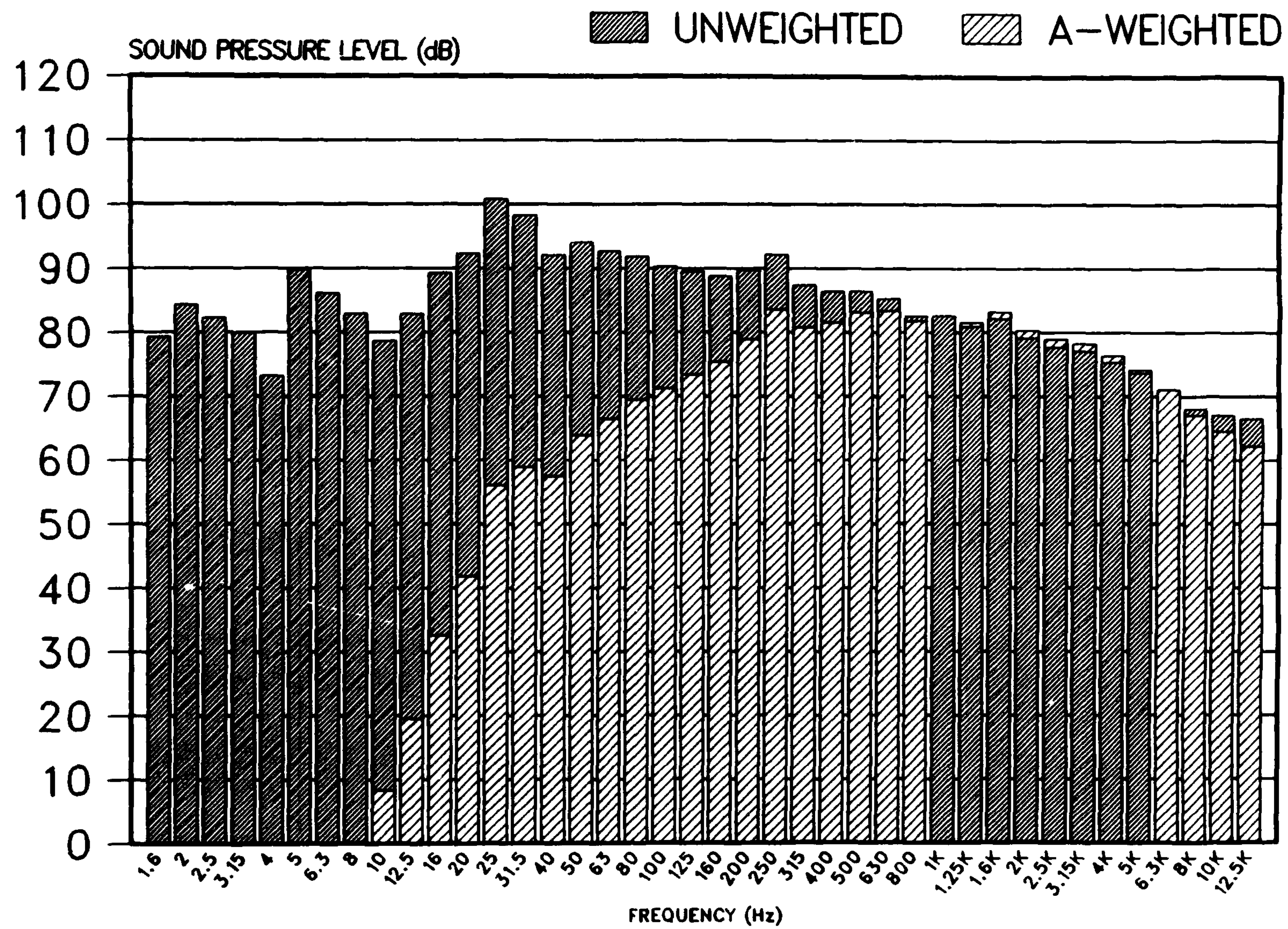


TABLE D-16: MEASURED SPECTRUM LEVELS.
LOCATION: COOLING TOWER PLATFORM CHAMBER
POSITION: STATION 4
CONDITION: 5 FANS

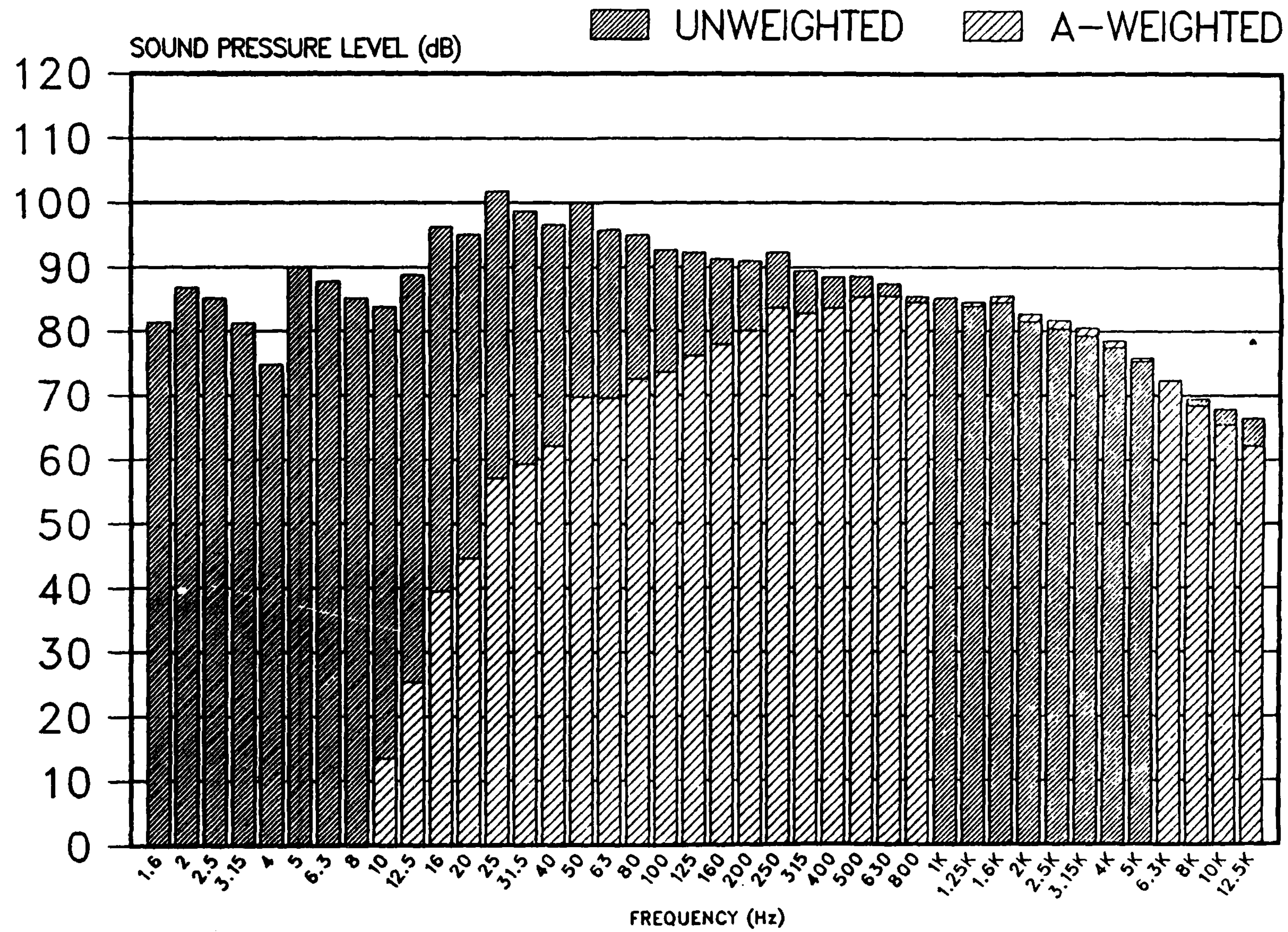
FREQ (HZ)	SOUND PRESSURE LEVEL (dB)	A-WT SOUND LEVEL [dB(A)]	C-WT SOUND LEVEL [dB(C)]	OCTAVE BAND SPL (dB)	A-WT OCTAVE BAND SL [dB(A)]	C-WT OCTAVE BAND SL [dB(C)]
1.6	81.4	0.0	0.0			
2	86.9	0.0	0.0	89.8	0.0	0.0
2.5	85.2	0.0	0.0			
3.15	81.3	0.0	0.0			
4	74.8	0.0	0.0	90.7	0.0	0.0
5	90.0	0.0	0.0			
6.3	87.8	0.0	0.0			
8	85.2	0.0	0.0	90.7	13.9	69.6
10	83.9	13.5	69.6			
12.5	88.9	25.5	77.7			
16	96.3	39.6	87.8	99.2	45.8	91.6
20	95.1	44.6	88.9			
25	101.8	57.1	97.4			
31.5	98.8	59.4	95.8	104.4	64.8	100.9
40	96.7	62.1	94.7			
50	100.0	69.8	98.7			
63	95.8	69.6	95.0	102.3	75.6	101.3
80	95.0	72.5	94.5			
100	92.7	73.6	92.4			
125	92.3	76.2	92.1	96.9	81.0	96.7
160	91.3	77.9	91.2			
200	91.0	80.1	91.0			
250	92.3	83.7	92.3	95.8	87.2	95.8
315	89.4	82.8	89.4			
400	88.5	83.7	88.5			
500	88.6	85.4	88.6	93.0	89.7	93.0
630	87.4	85.5	87.4			
800	85.4	84.6	85.4			
1000	85.2	85.2	85.2	89.7	89.6	89.7
1250	84.0	84.6	84.0			
1600	84.6	85.6	84.5			
2000	81.6	82.8	81.4	87.3	88.4	87.1
2500	80.4	81.7	80.1			
3150	79.3	80.5	78.8			
4000	77.5	78.5	76.7	82.4	83.4	81.7
5000	75.3	75.8	74.0			
6300	72.4	72.3	70.4			
8000	69.5	68.4	66.5	75.1	74.4	72.5
10000	67.9	65.4	63.5			
12500	66.5	62.2	60.3			

OVERALL LEVELS (1.6 - 12500 Hz)

OASPL = 108.3 dB OASLA = 95.4 dB(A)

OASLC = 105.9 dB(C) C-A VALUE = +10.5

FIGURE D–16: COOLING TOWER PLATFORM CHAMBER STATION 4 – 5 FANS OPERATING



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