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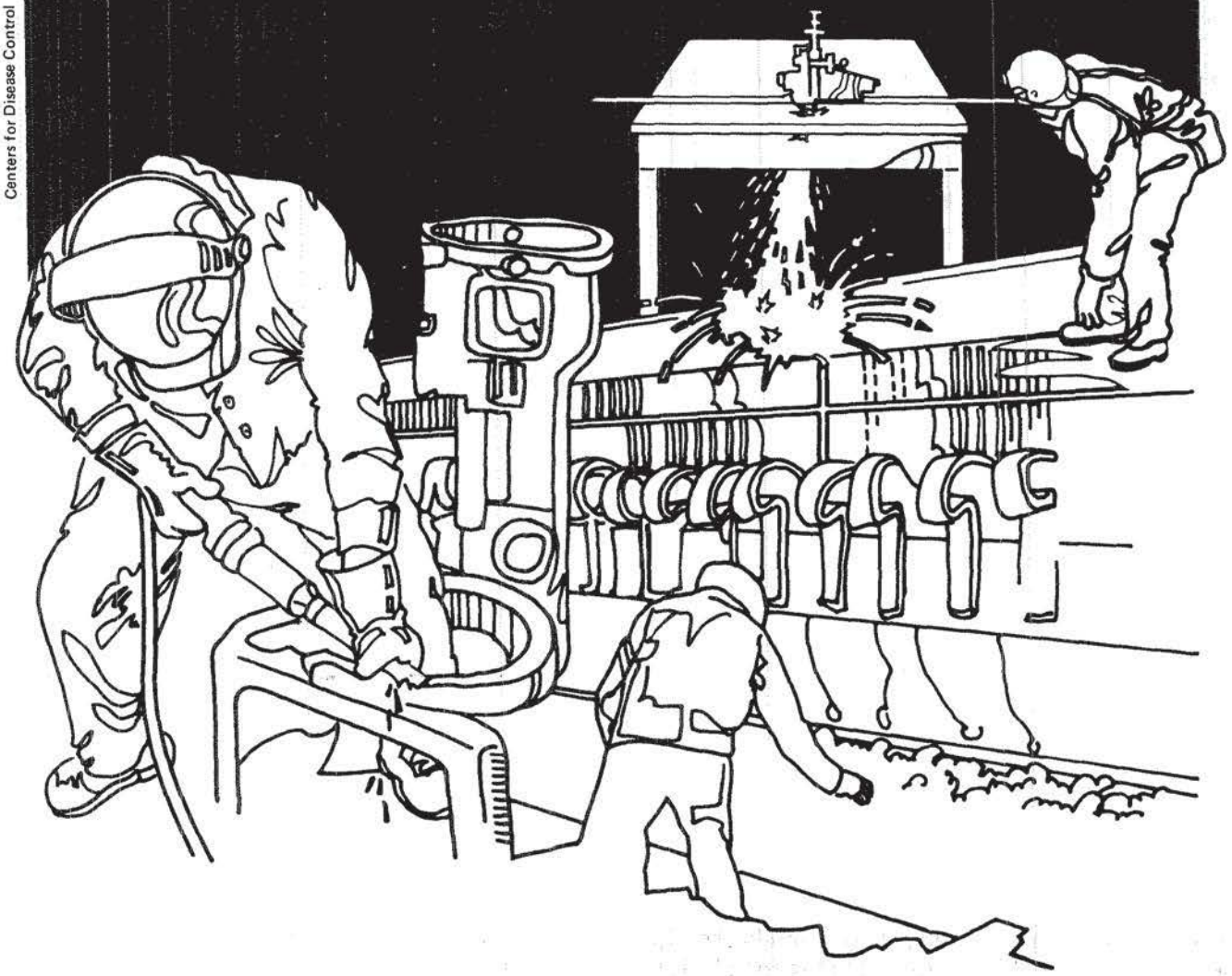

Health Hazard Evaluation Report

HETA 81-086-837
SOUTHERN BELL TELEPHONE COMPANY
HOLLYWOOD, FLORIDA

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.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HETA 81-086-837
March 1981
Southern Bell Telephone Company
Hollywood, Florida

NIOSH INVESTIGATORS:
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Jerome Flesch, M.S.

I. SUMMARY

In November 1980, the National Institute for Occupational Safety and Health, (NIOSH) received a request from Local 3120 of the Communications Workers of America to determine if sound levels experienced by telephone operators were hazardous. Approximately 40 of 320 employees at the Pasadena Lakes Facility of Southern Bell had reported exposure to loud unexpected high pitched tones coming through their headsets prior to the installation of a Universal Transmission Circuit (UTC). The UTC contains an Automatic Gain Control (AGC) Circuit to limit the level of electrical signals which could reach the operators' headsets.

On January 22, 1981, NIOSH visited the facility to determine sound level characteristics emanating from operator headsets. Results of tests conducted at four operator stations equipped with UTC's indicated that the maximum acoustic output level for -30 dB_m to +10 dB_m input signals over a frequency range of 125 to 4000 Hertz (Hz) was 88.5 dBA.

The current OSHA standard specifies a permissible exposure limit of 90 decibels, A-weighting scale (dBA) for a continuous 8-hour time-weighted average (TWA) exposure, with 5 dBA increases for each halving of time up to 115 dBA for a 15-minute exposure; further, individual impulses must not exceed 140 dB peak. NIOSH has subsequently recommended a limit of 85 dBA, as an 8-hr TWA.

On the basis of the NIOSH tests conducted on UTC-equipped telephone operator stations, and the sound levels introduced to the operator station throughout the course of a normal 8-hour workshift, it is highly unlikely that average noise levels would approach either OSHA or NIOSH-recommended standards; further, the UTC system currently in operation limits all audible headset tones to a maximum of 88.5 dBA, well below the OSHA peak permissible limit.

KEYWORDS: SIC: 4811 (Telephone communication), noise, telephone operators, headsets.

II. INTRODUCTION/BACKGROUND

In November 1980, NIOSH was requested by Local 3120, Communications Workers of America (CWA) to investigate reported cases of exposure of telephone operators to unexpected intense sounds coming through headsets at the Pasadena Lakes Facility of the Southern Bell Telephone Company.

Most of the sounds to which the operators were exposed have been traced to several sources: system test signals to which pranksters had gained access, computer modem carrier tones, remote controlled answering machine signals, touch tone dialing codes, and Company computer equipment. Other tones are of unknown origin. The Starset HS0501 headset in use by the operators contains a passive limiter to reduce electrical signal levels which would produce greater acoustic output than 117 dB sound pressure level (SPL) at the ear.

The tones to which the operators were exposed produced reported effects ranging from startle to tinnitus (ringing in the ear), dizziness, disorientation, muscle spasm, and intense pain.

The initial recommendation of NIOSH was that the Company install a compression amplifier which would limit the level of sound at the ear at a level lower than that provided for by the limiter in the Starset headphone. Southern Bell had already started installing a Universal Transmission Circuit (UTC, Model 4551) in each operator position and all positions had the device installed by November 15, 1980. The Regional Office of OSHA had inspected the installation and found it in compliance with OSHA regulations.

After installation of this equipment, one of the operators, who had been previously subjected to the sound and who had reported serious effects, reported being subjected again to the loud tones. At this time, the CWA requested that NIOSH assist them to determine the extent of the problem and to determine if the UTC was of any protective value.

On January 22, 1981, NIOSH investigators visited the Pasadena Lakes Facility of Southern Bell to evaluate these measures.

III. EVALUATION DESIGN AND METHODS

Two types of measurements were made. On four operator positions, electrical signals were introduced into the UTC at levels below and above that at which the circuit should limit the signal. The output of the operator headset was monitored and the acoustic sound pressure recorded. The purpose of this test was to determine if the device would limit the effect of signals which could occur on the line and, if it did, to what output level did the limiting correspond.

Test tones were produced by an oscillator and step-decade attenuator monitored with an appropriate voltmeter as shown in Figure 1. The attenuator was used to vary the input to the UTC test adapter (Model 252A) in 10 dB steps from -30 dB_m to +10 dB_m. The test frequencies used were 125, 250, 500, 1000, 2000 and 4000 Hertz (Hz). The option configuration screw positions on the UTC were also recorded. Acoustic output was monitored on a General Radio sound level meter which was connected to the headset by a 2 cc volume coupler designed for the purpose (Figure 2) and a size 4 earpiece.

A second test was done only on the first console position tested. Two test signals which had been identified as sources of some of the sounds to which operators were subjected were connected to the console and the acoustic output of the earphone was measured and listened to.

IV. EVALUATION CRITERIA

Exposure to high levels of noise may cause temporary or permanent hearing loss. The extent of damage depends primarily upon the intensity of the noise and the duration of the exposure. There is abundant epidemiological and laboratory evidence that protracted noise exposure above 90 decibels (dBA) causes hearing loss in a portion of the exposed population.

OSHA's existing standard for occupational exposure to noise (29 CFR 1910.95) specifies a maximum permissible noise exposure level of 90 dBA for a duration of 8 hours, with higher levels allowed for shorter durations. NIOSH, in its Criteria for a Recommended Standard, proposed a limit 5 dB less than the OSHA standard.

Time-weighted average noise limits as a function of exposure duration are shown below:

Duration of Exposure (hrs/day)	Sound Level, dBA NIOSH	OSHA
16	80	-
8	85	90
4	90	95
2	95	100
1	100	105
1/2	105	110
1/4	110	115*
1/8	115*	-
	-	140 dB**

*No exposure to continuous noise above 115 dBA

**No exposure to impact or impulse noise above 140 dB peak SPL.

When workers are exposed to sound levels exceeding the OSHA standard, feasible engineering or administrative controls must be implemented to reduce levels to permissible limits. OSHA has recently issued (although still in administrative review) a hearing conservation amendment to its noise standard. For workers exposed at or above a TWA of 85 dB, the amendment will require noise exposure monitoring, audiometric testing, the use of hearing protective devices where necessary, and employee education.

V. RESULTS, DISCUSSION, AND RECOMMENDATIONS

The maximum and minimum output levels for each of the four operators stations tested are shown in Table I.

For the positions tested, the acoustic output was limited to a maximum level of 88.5 dBA, which is less than the current OSHA continuous permissible exposure for an 8-hour day.

The output levels are all below the OSHA acceptable levels for continuous eight-hour exposures. Clearly, telephone operators are not exposed to continuous sound, but rather are exposed to intermittent speech with a total exposure of approximately 20% of actual time at the console which reduces the effective exposure of operator to levels well below even the more stringent noise limits recommended by NIOSH.

To demonstrate the effect of an operator connecting to either a 1 kHz test tone or the 24C loop check test tone (400 Hz to 2800 Hz sweep), each of these was accessed. The maximum acoustic output levels measured (Table II) were 86 dBA.

Two circuits which provide a limit to acoustic output at the operators' headset exist in the 100B position: 1) the UTC with an active limiter, and 2) the varistor limiter at the headset itself. The UTC limits to 89+2dB SPL, and the varistor limits to 117 dB SPL. The limiter in the headset is, therefore, superfluous acting only as a backup.

The OSHA standard for acceptable sound exposure levels specifies 115 dBA for 15 minutes as a maximum and impulses not to exceed 140 dB peak pressure. The UTC installed by Southern Bell limits sound pressures below these criterion levels. We find, therefore, that the 100B position with UTC does not pose a hazard to the operator. Because the varistors limit at 117 dB SPL at the ear, incorporation of the UTC AGC function is recommended.

VI. AUTHORSHIP & ACKNOWLEDGEMENTS

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VII. DISTRIBUTION AND AVAILABILITY 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. Southern Bell Telephone Company
2. Communication Workers of America, Local 3120
3. OSHA, Region IV
4. NIOSH, Region IV

For the purpose of informing the 320 affected employees, copies of the report shall be posted by the employer in a prominent place accessible to the employees, for a period of 30 calendar days.

Table I

MAXIMUM AND MINIMUM OUTPUTS FROM FOUR* OPERATOR
HEADSETS WITH FUNCTIONING UTC AGC

Southern Bell Telephone Company
Hollywood, Florida
January 22, 1981

INPUT TO UTC

FREQUENCY (HZ)	-30dB$_m$	-20dB$_m$	-10dB$_m$	0dB$_m$	+10dB$_m$
	OUTPUT FROM HEADSET dBA (max/min)				
125	48/44.5	59.5/54	69.5/64.5	72/67.5	74/69
250	64.5/61.5	75/73.5	83/79.5	84/80	84/80.5
500	74/70.5	84/82.5	87/84	88/84.5	88/84.5
1000	77/74	86/83	88/84	88.5/84.5	88.5/85
2000	76/73	85/83	86.5/83.5	87/84	87/84.5
4000	73/72	83/80	84.5/81	85/81.5	85/82

*Operator stations tested were
Unit 0, Position 17
Unit 0, Position 44
Unit 0, Position 61
Unit 1, Position 163

Table II

ACOUSTIC OUTPUT FOR COMPANY TEST TONES

Southern Bell Telephone Company
Hollywood, Florida
January 22, 1981

INPUT	OUTPUT
1 kHz Test Tone	85 dBA
24 C Loop Check Tone	86 dBA

Figure 1: Schematic of Noise Measurement Test System

Southern Bell Telephone Company
Hollywood, Florida

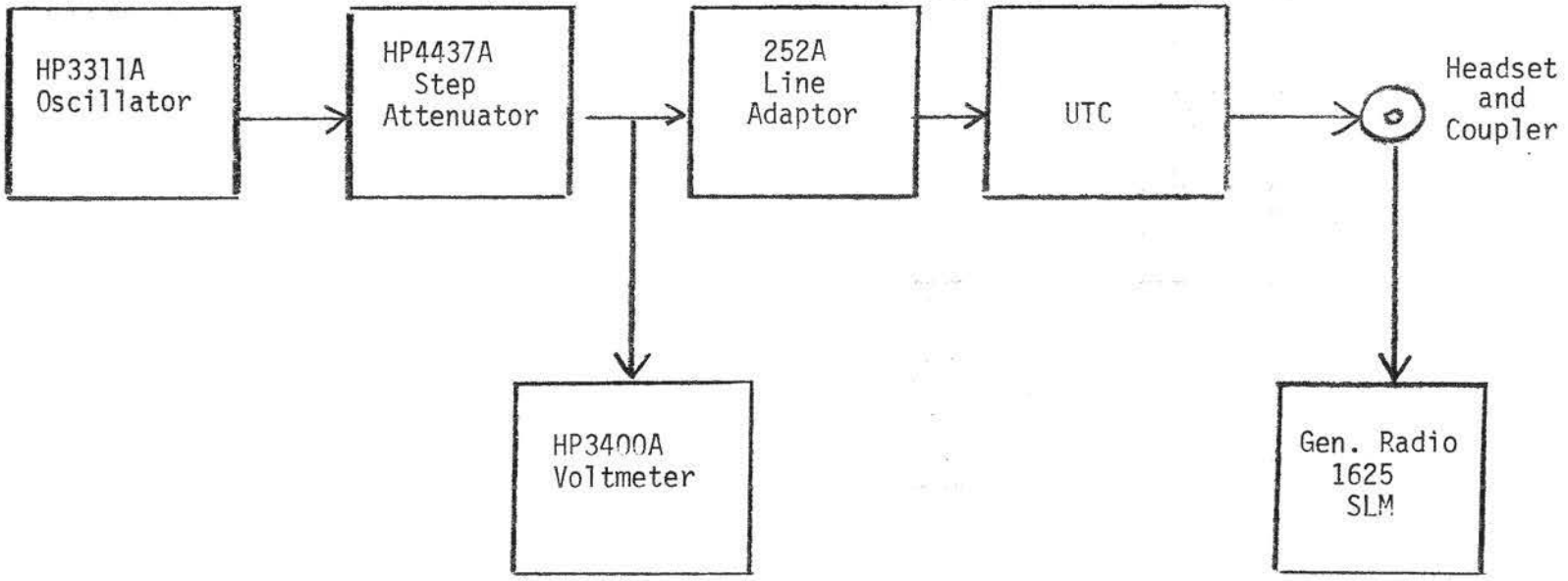
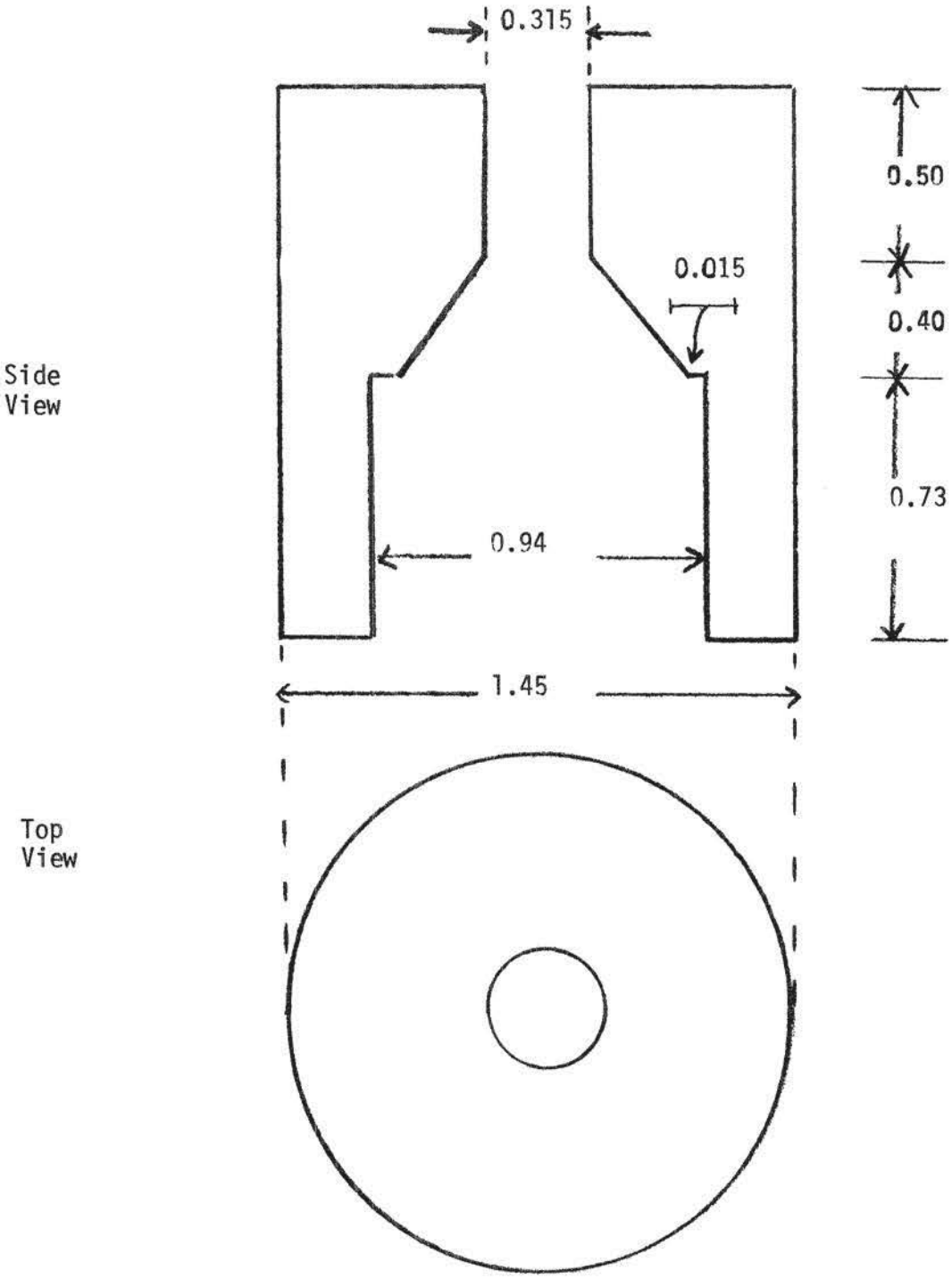


Figure 2: Schematic of Headset - GR SLM Aluminum Coupler*

Southern Bell Telephone Company
Hollywood, Florida



*Dimensions shown are in inches

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