central database where it can be used to fine tune training or inspection programs and to assist emergency responders. Cornell University's Hazard Assessment / Signage Program or HASP is a database application that allows a laboratory supervisor to describe each laboratory in terms of: 1) specific hazards and risk levels, 2) access restrictions, 3) precautions to follow, 4) staff names and contact information, and 5) information for emergency responders. A user guide explains the purpose and menu choices for each data field. A hazard/risk matrix provides an easy-to-follow assessment process. Many fields have "pop-up menus" to simplify data entry. Once the information is entered, the user prints the information by selecting one of several report formats. The report is posted as a door sign at each entrance to the laboratory. Each sign displays the text information that was entered and supplements it with colored icons that visually indicate hazards and risk levels. The data is merged with records from all other laboratories in our campus on our central data server. HASP is easy to use and inexpensive to operate. We find that laboratory managers are eager to implement HASP in their facilities. They have agreed to update the information whenever there is any significant change in the operation of their laboratory. We feel the program is maintainable and will continue to foster communication between our laboratory safety professionals and laboratory workers across campus.

## 293

DESIGN AND EVALUATION OF A PROTOTYPE LABORATORY EMISSION CONTROL DEVICE FOR USE IN A VARIABLE AIR VOLUME, FACE VELOCITY REDUCING SYSTEM. S. Lacey, University of Illinois at Chicago, Chicago, IL.

A prototype perforated backplane air baffle for a laboratory safety hood was designed, fabricated and its performance was evaluated experimentally. Relative to the historically poor performance of slot baffle design, the perforated metal created better laminar flow through the hood, and decreased turbulence in the form of vortices, ultimately resulting in better hood containment.

Three methods were employed to evaluate the hood's performance: 1) face velocity testing, 2) tracer gas containment testing, and 3) smoke containment. Face velocity data were analyzed to evaluate turbulence and consistency across the hood face with the use of new statistical methods. It was determined that turbulence decreased and velocity uniformity increased as the average face velocity increased and as the open area of the hood face decreased.

Tracer gas levels outside of the hood, in the operator's breathing zone, were below detectable levels (0.02 ppm) at all face velocity / sash position settings. In this work, a Hood Protection Factor was developed as a quantitative means to compare hood performance. The Hood Protection Factor is a true ratio of the contaminant concentration inside the hood exhaust duct to that in the operator's breathing zone, as both are measured values.

A qualitative assessment of the hood's performance was completed by means of smoke testing. Smoke testing showed that smoke was captured / retained without escaping from the hood at all face velocity / sash position settings.

Static pressure measurements were taken at the back panel of the hood. Graphical analysis of these data allowed visualization of the uniformity of suction across the perforated air baffle.

The prototype backplane air baffle provided reduced turbulence at the hood face, allowing improved containment efficiency. New performance monitoring techniques and statistical evaluation methods were developed so health and safety professionals may better evaluate and design laboratory fume hoods.

# Noise
# Papers 294–296

## 294

EFFICIENCY VS. ACCEPTABILITY OF HEARING PROTECTORS IN INDUSTRIAL ENVIRONMENTS. P. Arezes, A. Miguel, University of Minho, Guimaraes, Portugal.

Although hearing protectors must be used as a temporary solution, their choice must be carefully thought of and not based in superficial considerations. The chosen hearing protector should be adapted both to the user and work environment. The selection of hearing protection shouldn't be, however, exclusively determined by the acoustical attenuation characteristics of the device. Other, equally important, ergonomics features associated with this kind of protective device must be taken into account. The present study aims to analyse the relationship between the efficiency and the ergonomics aspects related to the comfort afforded by hearing protectors, and consequently their acceptability, when used in industrial noisy environments. A comfort evaluation was performed using a questionnaire, which was filled in by 20 workers of 2 industrial companies, whose workplaces presented noise pressure levels higher than 90 dB(A). Several scales related to the subjective feeling of comfort were used to quantify the comfort index of a given protection device. These were subsequently converted into a single index, CI. Simultaneously, the wearing time of each protector was self-recorded by each subject. A Spearman correlation index was used to select the comfort index parameters. To test the relationship between the comfort index and the time during which, protectors were used, it was applied a variance analysis (ANOVA). Results obtained seem to demonstrate there are significant differences between catalogued and effective attenuation. Protection devices with less catalogued attenuation, but with higher acceptability, i.e., more comfortable, tend to be more efficient than protectors with higher catalogued attenuation, but less comfortable. Finally, it must be emphasised that high efficiency of the device can only be achieved through the attainment of an adequate balance between the range of parameters likely to determine its usage.

## 295

AN ASSESSMENT OF NOISE EXPOSURE IN AUTOMOBILE PRESS LINE. J. Jeong, S. Park, K. Yoo, H. Chung, Occupational Safety and Health Research Institute, Korea Occupational Safety and Health Agency, Inchon, Republic of Korea.

One hundred seventy-nine noise exposure samples were collected from automobile press lines from June to August in 2000. All noise exposure data were sampled for daytime work shift using noise dosimeter, which recorded both time-weighted average (TWA) and 1-min average. The exposure of the workers was evaluated using the Occupational Safety and Health Administration (OSHA) and National Institute for Occupational Safety and Health (NIOSH) criteria according to job tasks at press working, such as press operator, crane operator, forklift driver. The crane operators could be exposed to press noise because they worked around the press line by using a wireless remote controller. Also the forklift drivers could be exposed to press noise and engine noise of forklift during loading of the press products. The mean OSHA TWA was 82.5 dB(A) +(-) 6.1 dB(A) for press operators, 78.5 dB(A) +(-) 5.1 dB(A) for crane operators, 79.6 dB(A) +(-) 4.7 dB(A) for forklift drivers.The mean NIOSH TWA was 89.3 dB(A) +(-) 2.3 dB(A) for press operators, 88.5 dB(A) +(-) 2.0 dB(A) for crane operators, 87.7 dB(A) +(-) 2.6 dB(A) for forklift drivers. Among OSHA TWA samples for press operators, fourteen percent exceeded 90 dB(A), the OSHA permissible exposure level, but OSHA TWA samples for crane operators and forklift drivers didn't. NIOSH TWA samples over 85 dB(A), the NIOSH recommended exposure limit, were 96.2% (press operators), 91.6% (crane operators), 88.9% (forklift drivers). NIOSH TWA samples were significantly higher than OSHA TWA samples ($p < 0.01$). Regression analysis was used to obtain relationships between OSHA and NIOSH TWA samples. In this case the coeffcient of determination is 0.90, which shows the high degree association between two measurements. Regression equation, NIOSH TWA = 0.552 * OSHA TWA + 42.13 dB(A), shows that if OSHA TWA is known, NIOSH TWA can be predicted by the equation.

## 296

IMPLEMENTION OF AN EFFECTIVE LOW COST ENGINEERING CONTROL FOR AN HVAC RELATED NOISE PROBLEM AT A PEDIATRIC HOSPITAL. R. Stephenson, B. Weinstein, Children's Hospital Medical Center, Cincinnati, OH; C. Nenadic, CES Inc., Cincinnati, OH; R. Tubbs, NIOSH, Cincinnati, OH.

In follow-up to a request from hospital administration, evaluation of the noise being produced by the HVAC system which serves several executive offices located on the 5th floor of the Outpatient Services Building (OSB) was initiated in October 1999. Octave band and A- and C-weighted sound pressure level measurements were made at various locations in the fifth floor executive suite. The primary source of the noise in the executive suite is the HVAC unit which is located on the fifth floor in a mechanical room adjacent to the executive suite. The noise energy is produced by two different sources: the fan in the HVAC system, and the vibration of the supply duct(s) which transport air from the HVAC unit to the executive suite. The A-weighted (dBA) sound pressure level (SPL) readings collected throughout the entire office suite averaged 59.5 dB(A). While not considered to be hazardous under provisions of the OSHA standard, readings of this magnitude may constitute an annoyance in office environments because of the reduced ability to communicate effectively. ANSI addresses these concerns in a standard intended for evaluating room noise. Recommended sound pressure levels in executive office space are not to exceed 38 dB(A). Minor modifications in the fan operating parameters resulted in a significant noise reduction of 17 dBA (from 59.5 to 42.5 dBA). As a result, the work environment has improved, and the noise-related complaints from the office staff have ceased.

aih ce

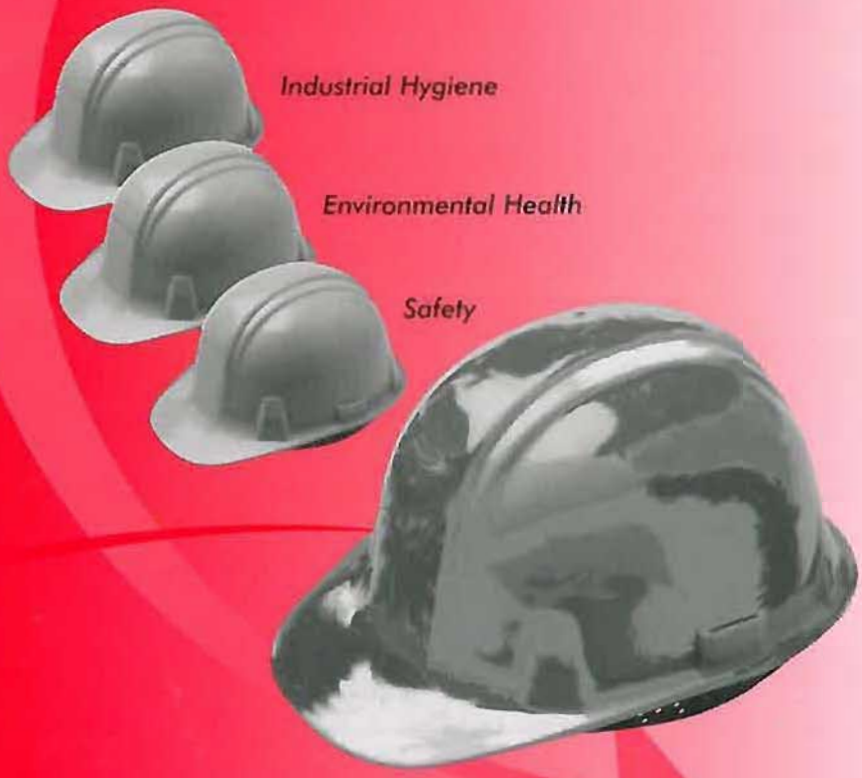
*American Industrial Hygiene Conference & Exposition . . . The PREMIER CONFERENCE for occupational and environmental health and safety professionals globally.*

June 2–7, 2001

**Ernest N. Morial Convention Center**
**New Orleans, LA**

*Cosponsored by AIHA and ACGIH*

# Embracing Change






# ABSTRACTS