DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

National Institute for Occupational Safety and Health
Robert A. Taft Laboratories
4676 Columbia Parkway
Cincinnati OH 45226-1998

August 4, 2003
HETA 2003-0212

Patrick Griffis
Assistant Officer
U.S. Department of Transportation
Transportation Security Administration
Cincinnati-Northern Kentucky International Airport
3940 Olympic Blvd. #205
Erlanger, KY 41018

Dear Mr. Griffis:

This letter is in response to your request to the National Institute for Occupational Safety and Health (NIOSH) for a Health Hazard Evaluation (HHE) at the Cincinnati/Northern Kentucky International Airport (CVG) in Erlanger, Kentucky. The request described concerns about symptoms including headaches, sneezing, and congestion that may be related to airborne particulate generated by conveyer belts in the baggage screening area.

Background & Discussion

When passenger luggage is checked for an airline flight at CVG, those on flights departing from gates in terminal B are loaded onto a conveyor belt which runs beneath the airport terminal. All luggage is combined onto a main conveyor system that runs through one of four X-ray screening machines. Based upon the X-ray screening, specific pieces of luggage are then selected for additional screening. Baggage screeners manually run a pre-treated swab over the additionally screened luggage using a wand and the swab is scanned by a machine for explosive substances. The contents of the luggage are also searched by hand. Once the luggage clears the screening process, it is manually loaded back onto the conveyor belt system to be delivered at the appropriate departure gate.

The conveyor belt system is approximately nine years old and consists of nearly seven and one-half miles of conveyor belts. Due to federally mandated security changes, the conveyor area under terminal B was remodeled to accommodate the new screening equipment and work areas. This work was completed and the system began running on February 1, 2003. Future process plans include automating the line distribution area so that baggage screeners will manually handle the luggage less frequently.

On April 4, 2003, NIOSH industrial hygienists visited CVG to observe employee work practices in the baggage screening area and to determine what environmental sampling was necessary. Air samples were collected on thermal desorption tubes in three areas and from the breathing zone of one baggage screener to identify volatile organic compounds present. The thermal desorption tubes were attached by Tygon® tubing to sampling pumps calibrated at a flow rate of 50 cubic centimeters per minute (cc/min). Each thermal desorption tube contained three beds of sorbent material: a front layer of Carbopack Y™, a middle layer of Carbopak B™, and a back section of Carboxen 1003™. The stainless steel thermal desorption tubes for low level volatile organic compounds were analyzed by the NIOSH laboratory in a Perkin-Elmer ATD 400 automatic thermal desorption system and analyzed using a gas chromatograph with a mass selective detector in accordance with NIOSH Method 2549.[1] Since the sampling and analytical techniques for this method have not been validated for these compounds, all results should be considered semi-quantitative.

Major compounds identified on the samples were tetrafluoroethane, xylene, acetone, isopropanol, toluene, naphthalene, and butyl cellosolve.[2] Many of these compounds are found in ambient air while others come from the pre-treated swabs used for explosive screening, the Fellows Air Duster, Simple Green cleanser, and the alcohol cleaners used by screeners in their work areas. These compounds were not identified at levels posing a health threat to baggage screeners.

Carbon dioxide (CO_2), temperature, and relative humidity were measured as indicators of IEQ conditions using a TSI Q-Trak Plus (Model 8554). CO_2 is a normal constituent of exhaled breath and can be used as a screening technique to evaluate whether adequate quantities of outdoor air are being introduced into an occupied space. Indoor CO_2 concentrations are normally higher than the generally constant ambient CO_2 concentration (range 300–350 parts per million [ppm]). When indoor CO_2 concentrations exceed 800 ppm in areas where the only known source is exhaled breath, inadequate ventilation is suspected.[3] Elevated CO_2 concentrations suggest that other indoor contaminants may also be increased. It is important to note that CO_2 is not an effective indicator of ventilation adequacy if the ventilated area is not occupied at its usual level. Measurements taken on the day of the survey are shown in Table 1 and do not indicate elevated levels of CO_2.

Temperature and relative humidity measurements are often collected as part of an IEQ investigation because these parameters affect the perception of comfort in an indoor environment. The American National Standards Institute (ANSI)/American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 55-1992 specifies conditions in which 80% or more of the occupants would be expected to find the environment thermally acceptable.[3] Assuming slow air movement and 50% RH, the operative temperatures recommended by ASHRAE range from 68°F to 74°F in the winter, and from 73°F to 79°F in the summer. The difference between the two is largely due to seasonal clothing selection. ASHRAE also recommends that RH be maintained between 30 and 60% RH.[3] Excessive humidity can support the growth of microorganisms, some of which may be pathogenic or allergenic. Measurements taken on the day of the survey are shown in Table 1 and lie within the recommended ASHRAE ranges.

Table 1 Indoor Environmental Quality Measurements
Terminal B Baggage Screening
April 4, 2003

Location	Time (military)	Carbon dioxide (ppm)	Relative Humidity (%)	Temperature (°F)
Screening Area, Line 1	10:59	585	47.0	74.5
Screening Area, Line 2	10:58	483	48.3	73.6
Screening Area, Line 3	10:57	459	48.0	73.6
Line distribution	11:02	575	45.5	74.5
Equipment Table	10:53	444	47.4	74.7

During the first NIOSH site visit, the screening area was not operating at peak volume. Thus, on June 12, 2003, a NIOSH industrial hygienist returned to CVG to observe work practices and measure total dust during a peak work shift. Air samples were collected in one area and from the breathing zone of eight individuals on tared 37-millimeter (mm) diameter, (5 micrometer [μm] pore-size) polyvinyl chloride (PVC) filters at a calibrated flow rate of 2 liters per minute (Lpm). The filters were gravimetrically analyzed (filter weight) according to NIOSH method 0500.[1] Total dust concentration results from these samples ranged from none detected to 0.094 mg/m^3. The Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) for total particulate classified as not otherwise recognized (PNOR) is 15.0 mg/m^3, determined as 8-hour averages.[4] The American Conference of Governmental Industrial Hygienists (ACGIH) recommended Threshold Limit Value (TLV) for exposure to PNOC, is 10.0 mg/m^3 (inhalable dust, 8-hour time-weighted average).[5] These are generic criteria for airborne dusts which do not produce significant organic disease or toxic effect when exposures are kept under reasonable control.[6] Excessive concentrations of PNORs in the work-room air may seriously reduce visibility; may cause unpleasant deposits in the eyes, ears, and nasal passages; or can contribute to injury to the skin or mucus membranes by chemical or mechanical action or by the rigorous skin cleansing procedures necessary for their removal.[7] NIOSH has not assigned a recommended Exposure Limit (REL) for PNOR.[8]

The Thermo Anderson Personal DataRAM™ (Model PRD 1200, Smyrna, GA) was used to provide continuous recording of airborne particulate concentrations during the work shift. An SKC AirCheck pump was used to pull air through the DataRAM™ at 2 liters per minute (Lpm). The dust concentration throughout the shift varied, with the highest concentrations (0.06 mg/m^3 peak) measured from 14:15 - 16:37, which corresponds to the peak in work activity during the observed shift. These results indicate that the concentrations do not exceed the ACGIH TLV or the OSHA PEL.

Carbon dioxide, temperature, and relative humidity were also measured during the second visit. (Table 2). Carbon dioxide and temperature measurements and lie within the recommended ASHRAE ranges. However, the relative humidity measurements were elevated during the first part of the shift.

Table 2 Indoor Environmental Quality Measurements
Terminal B Baggage Screening
June 12, 2003

Location	Time (military)	Carbon Dioxide (ppm)	Relative Humidity (%)	Temperature (°F)
Screening Area	13:55	449	71.1	73.5
Screening Area	14:45	550	75.1	69.4
Screening Area	18:00	501	60.9	74.5
Screening Area	20:10	525	55.6	74.8

Conclusions & Recommendations

The conveyor belt system is currently on a 91-day preventative maintenance schedule and is comprised primarily of polyurethane and rubber, which is typical for such airport systems. Damage to the belts is typically due to metal pieces on luggage causing tears, rather than disintegration. Based on observation, the conveyor belt system appeared to be in good shape at the time of the surveys. This fact, in addition to the low dust concentrations measured during the NIOSH survey, leads to the conclusion that dust from the conveyor belt system does not pose a health hazard in the Terminal B baggage screening area.

Based upon the measurements and observations made during the NIOSH survey, the following recommendations are suggested to improve the working environment for CVG baggage screeners:

- Support columns in the work area should be enclosed to prevent dust generation that results from flame retardant material crumbling upon contact or a new fire retardant material that can withstand contact should be used. Either method implemented should meet all applicable fire codes.

- The heating, ventilation, and air conditioning (HVAC) system should be checked and balanced by consulting an HVAC engineer with knowledge of commercial HVAC design and ASHRAE standards and guidelines. It is understood that the system was recently installed, but the elevated relative humidity measurements during the survey indicate a potential problem.

- Safety glasses should be worn by baggage screeners in accordance with 29 CFR 1910.133(a)(1) when cutting locks off luggage. In order to manually search luggage locks must often be destroyed, causing pieces to be projected into the screeners' work area. Removal of locks in this manner may potentially cause a hazard to the eyes.

- Whenever possible, work areas should be cleaned using a vacuum instead of compressed air. The use of compressed air will cause settled particulate to become re-suspended in the ambient air.

- Form a joint committee of management and employees to address health and safety concerns and implement related programs.

I hope this information is helpful in ensuring a safe and healthy workplace for employees at CVG. This letter will serve to close out NIOSH's involvement in this request. To comply with NIOSH regulations regarding informing employees of this HHE (CFR Title 42, Part 85, Section 85.11), this report should be posted in a prominent place accessible to all affected employees for a period of at least 30 calendar days. If you have any questions, please do not hesitate to contact Erin Snyder at (513) 841-4427 or Chad Dowell at (513) 841-4202.

Sincerely yours,

Erin M. Snyder, MS
Industrial Hygienist
Industrial Hygiene Section
Hazard Evaluations and Technical Assistance Branch
Division of Surveillance, Hazard Evaluations and Field Studies

Chad Dowell, MS
Industrial Hygienist
Industrial Hygiene Section
Hazard Evaluations and Technical Assistance Branch
Division of Surveillance, Hazard Evaluations and Field Studies

Keywords: Airports, IEQ, particulate, conveyor belt system

SIC Code: 4581 Airports, Flying Fields, and Airport Terminal Services

Toxicity Determination: Negative

References:

1.NIOSH [1985]. Eller PM, ed. NIOSH manual of analytical methods. 4th rev. ed., Vol. 2. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 84–100.

2.Grote, A. [2003]. CEMB Analytical Laboratory Report, Qualitative Analysis of Thermal Desorption Tubes. Sequence number 10053-AA. HETA 03-0212. May 13, 2003.

3.ASHRAE [1992]. Thermal environmental conditions for human occupancy. American National Standards Institute/ASHRAE standard 55-1992. Atlanta, GA: American Society for Heating, Refrigerating, and Air-Conditioning Engineers, Inc.

4.OSHA. Toxic and hazardous substances, 29 C.F.R. 1910 Subpart Z. U.S. Department of Labor, Occupational Safety and Health Administration, Washington, DC. World Wide Web [URL = http://www.osha-slc.gov/OshStd_toc/OSHA_Std_toc_1910_SUBPART_Z. html] accessed July 31, 2003.

5.ACGIH [2003]. 2003 TLVs® and BEIs®: threshold limit values for chemical substances and physical agents. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.

6.ACGIH [1986]. Documentation of threshold limit values and biological exposure indices for chemical substances and physical agents. Cincinnati, OH: American Conference of Governmental Industrial Hygienists.

7.NIOSH [1981]. NIOSH/OSHA occupational health guidelines for chemical hazards. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 81-123.

8.NIOSH. NIOSH pocket guide to chemical hazards (DHHS (NIOSH) publication 97-140). United States Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Cincinnati, OH 1997.