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PHILADELPHIA NEWSPAPERS, INC.
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I. SUMMARY

On August 9, 1990, the National Institute for Occupational Safety and Health (**NIOSH**) received a confidential request from employees of Philadelphia Newspapers Inc. to evaluate a potential health hazard from ethylene oxide, diesel exhaust emissions, newsprint dust, ink mist, and other potential air contaminants. The environmental and medical portions of the investigation were conducted in the track six mail room on the night and early morning of December 11 and 12, 1990. The track six mail room was originally designed and used as a warehouse to store rolls of newsprint. It is now the site of the production area where inserts, such as advertising circulars and newspaper supplements, are inserted into the body of the newspaper, and where assembled papers are bundled, tied, and loaded onto trucks.

Approximately sixty-five employees worked in the track six mail room on the night of the survey. With the exception of the pallet truck drivers, employees (known as mailers) rotate their positions every thirty minutes during the shift, which runs from about 11:00 pm to 5:00 am. The process will be relocating to a new facility in January, 1992.

Private interviews were conducted with fourteen third shift employees. Several employees from each work station were selected by management during the walkthrough portion of the investigation and asked to participate in an interview.

Environmental monitoring was conducted to determine employee exposure to newsprint dust and ink mist. To assess the overall indoor air quality, the temperature, relative humidity, and carbon dioxide concentrations in the track six mail room were measured in various locations at about 1:00 am and again at about 3:00 am. Organic vapor screening samples were collected as well. To assess employee exposure to diesel exhaust emissions, aldehyde screening samples were collected at various locations in the track six mail room, and detector tube samples were collected for oxides of nitrogen.

Air sampling results did not indicate any contaminants in levels which could be considered unacceptable. Eight-hour time-weighted average (**TWA**) particulate concentrations ranged from 0.01 milligrams per cubic meter (**mg/M^3**) to 0.32 mg/M^3. The amounts of ink mist in fifteen samples were below the limit of detection, and were below the limit of quantitation in the remaining five samples. Hydrocarbon concentrations were below all relevant criteria. No aldehydes or oxides of nitrogen were detected. It should be emphasized that while this represents the exposures only on the night of the site visit, the date for the site visit was based upon the requestor's opinion that a busy winter night would represent the worst conditions.

Of the 14 workers interviewed, seven (50%) reported upper respiratory and/or eye irritation that worsens while they are at work. Caution should be used in interpreting these data due to the small number of persons interviewed; the rate of symptoms among the entire workforce may be lower or higher than was reported by the interviewees.

Temperatures ranged from 71 to 85°F and relative humidity levels ranged from <10 to 23%. This indicates the need to reduce the heat, increase the relative humidity, and utilize mechanical ventilation to introduce outside air in the winter months rather than rely only

on infiltration, which invites the unwanted introduction of odors from the loading dock, and leads in part to the warm, dry conditions in the track six mail room (these conditions could also result in part from heating without humidification, process heat, and the hygroscopic nature of newsprint). Outside temperatures colder than the night of the survey may result in detectable concentrations of diesel exhaust emissions entering the track six mail room as a result of a tendency among drivers to leave trucks idling in cold weather and the reported tendency of exhaust emissions to remain in the loading dock area in very cold weather.

On the basis of the data obtained during this investigation, the NIOSH investigators determined that workers in the track six mail room are not at risk of harmful exposure to newsprint dust, ink mist, or diesel exhaust emissions. Relying on infiltration alone to bring outside air into the area in the winter months leads in part to warm, dry conditions, which may contribute to reported eye and respiratory irritation.

KEYWORDS: SIC 2711, Newspaper, Mailroom, Loading Dock, Diesel Exhaust, Ink Mist, Newsprint Dust, Paper Dust.

II. BACKGROUND

On August 9, 1990, the National Institute for Occupational Safety and Health (**NIOSH**) received a confidential request from employees of Philadelphia Newspapers Inc. to evaluate a potential health hazard from ethylene oxide, diesel exhaust emissions, newsprint dust, ink mist, and other potential air contaminants. The environmental and medical portions of the investigation were conducted in the track six mail room on the night and early morning of December 11 and 12, 1990. That time was chosen, after consulting with a requestor, to represent a worst-case exposure situation: Christmas sales would lead to a high volume of circulars, and the ventilation system would be shut down for the winter.

The track six mail room was originally designed and used as a warehouse to store rolls of newsprint. It is now the site of the production area where inserts, such as advertising circulars and newspaper supplements, are inserted into the body of the newspaper, and where assembled papers are bundled, tied, and loaded onto trucks. The process begins when machines known as winders wind inserts onto cassettes, which are transported to unwinders. The unwinders unwind the inserts from the cassettes and feed them onto drums, where they are inserted into the body of the newspaper. An overhead conveyor system (gripper) transports the body of the newspaper to the drums. Assembled newspapers move to stackers, then to tiers, and move down a tray system to the loading dock. Another system, the Ferag, is also used to feed inserts.

Electric pallet trucks are used to move cassettes from the winders to the unwinders. Non-electric industrial trucks are used for transporting loads during the daytime only, when the track six mail room is not in operation. The battery-charging station for the pallet trucks is in the track six mail room. It is equipped with a local exhaust ventilation system. Heat in the area is provided by unit heaters regulated by limit switches. Smoke dampers are located on the south wall of the room. There is an air conditioning system which operates in the spring, summer, and fall seasons. In the winter, fresh air is provided by infiltration alone. There is a local exhaust ventilation system on the loading dock, and signs posted indicating a policy which requires drivers to shut off their engines while parked at the docks. Other features of the track six mail room include a trash storage area in the room immediately adjacent to the rear of the track six mail room, and an ink storage tank room located on the floor below, in the front of the track six mail room. The returns for the air conditioner are located near the trash storage area. The ink storage tank room is equipped with its own supply and exhaust ventilation.

Approximately sixty-five employees worked in the track six mail room on the night of the survey. With the exception of the pallet truck drivers, employees (known as mailers) rotate their positions every thirty minutes during the shift, which runs from about 11:00 pm to 5:00 am. The process will be relocating to a new facility in January, 1992.

One other operation of interest in the track six mail room is the process by which the grippers are cleaned. The grippers are cleaned every six months using enclosed equipment containing an aqueous solution which lists among its ingredients 1% ethylene oxide and 1% triethanolamine. The basic character of the cleaner, which also contains 2% sodium phosphate, 2.5% sodium carbonate, 3% "alkali silicate", and 2% "metal silicate", would cause the ethylene oxide in the solution to react to form ethylene glycols. This reaction occurs with epoxides with relief of ring strain as the driving force.[1] Cleaning is performed in a two-step process. The first step involves the application of full-strength cleaning solution under

pressure to the conveyor. The second step is a rinse to dislodge built-up waste and rinse the solution from the conveyor. Both steps are performed when no operators are in the area. This operation was not scheduled during the health hazard evaluation.

III. MEDICAL EVALUATION

Private interviews were conducted with fourteen third shift employees. Several employees from each work station were selected by management and asked to participate in an interview during a walkthrough conducted by management and NIOSH. The mean age was 54 years (range: 40-63). Eleven of the fourteen had worked on Track Six since it began operation in 1985, two had worked there four years, and the remaining one had worked on track six for three years. Employees were asked about respiratory symptoms and skin and eye irritation in the past month; and whether they perceived any symptoms to be work-related (Table 1). The most commonly reported symptoms were nasal congestion (43%), cough (36%), and eye irritation (29%). Nine of the fourteen employees interviewed reported the occurrence of at least one symptom in the past month; seven of those reported multiple symptoms.

Seven employees (50%) reported that their symptoms worsened while they were at work; diesel fumes and paper dust were associated with worsening of symptoms.

IV. INDUSTRIAL HYGIENE EVALUATION

Methods

Environmental monitoring was conducted to determine employee exposure to newsprint dust and ink mist. To assess the overall indoor air quality, the temperature, relative humidity, and carbon dioxide concentrations in the track six mail room were measured in various locations at about 1:00 am and again at about 3:00 am. Organic vapor screening samples were collected as well. To assess employee exposure to diesel exhaust emissions, aldehyde screening samples were collected at various locations in the track six mail room, and detector tube samples were collected for oxides of nitrogen.

Newsprint Dust

Twenty personal breathing zone, full-shift samples were collected for total particulate in accordance with NIOSH method 0500.[2] Samples were collected using tared 37-millimeter (**mm**) polyvinyl chloride (**PVC**) filters in two piece cassettes with battery-powered personal sampling pumps (Gillian HFS 113) calibrated to 2 liters per minute. Gravimetric analysis was performed according to NIOSH method 0500, with the following modifications: 1) The filters were stored in an environmentally controlled room (21$\pm$3 °C and 40$\pm$3% RH) and were subjected to room conditions for stabilization. This reduced the method's 8-16 hour stabilization time to 5-10 minutes. 2) The filters and back up pads were not vacuum desiccated.

Ink Mist

The same filters used to collect total particulate samples were subsequently analyzed for ink mist by infrared spectrophotometry in accordance with NIOSH method 5026.[2]

Indoor Air Quality

Temperature and relative humidity were measured using an aspirated psychrometer (Psychrodyne, Environmental Tectonics Corp., Southampton, PA).
Carbon dioxide levels were measured using a Gas Tech RI 411 CO_2 monitor, calibrated before and after sampling.

Full-shift general area air samples for hydrocarbons were collected at column C-3 and column E-8 in track six mail room. Sampling was performed using charcoal tubes and battery-powered air sampling pumps at a flow rate of 200 milliliters per minute (**mL/min**)

A full-shift charcoal tube air sample was collected in the ink room. This sample and a bulk sample of ink were submitted for qualitative analysis of volatile organic compounds by gas chromatography-mass spectroscopy (**GC-MSD**). Other charcoal tubes were analyzed quantitatively for the specific compounds of interest identified by the qualitative analysis according to NIOSH methods 1501 and 1550, except that a thirty-meter fused-silica capillary column containing the phase SPB-1 was used.[2]

Diesel Exhaust

Full-shift, general area aldehyde screening samples were collected at columns C-3, C-10, and E-8 using Orbo-23 sorbent tubes and low-flow battery-operated sampling pumps at a flow rate of 50 mL/min and analyzed in accordance with NIOSH method 2539.[2] These locations were selected because they were supposedly representative of locations in the air flow path between the loading dock and the track six mail room work stations.

Detector tubes were used to sample for oxides of nitrogen.

V. EVALUATION CRITERIA

As a guide to the evaluation of the hazards posed by work place exposures, NIOSH field staff employ environmental evaluation criteria for the assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed from eight to ten hours a day, forty hours a week, for a working lifetime without experiencing adverse health effects. However, it is important to note that not all workers will be protected from adverse health effects if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy). In addition, some hazardous substance may act in combination with other work place exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled to the level set by the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, thus potentially increasing the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the work place are: 1) NIOSH Criteria Documents and Recommended Exposure Limits (**RELs**), 2) the American Conference of Governmental Industrial Hygienists' (**ACGIH**) threshold Limit Values

(**TLVs**), and 3) the US Department of Labor (**OSHA**) Permissible Exposure Limits (**PELs**).[3,4,5] The OSHA PELs may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; in contrast, the NIOSH-recommended exposure limits are primarily based upon the prevention of occupational disease. In evaluating the exposure levels and the recommendations for reducing those levels found in this report, it should be noted that industry is legally required to meet those levels specified by an OSHA PEL.

A time-weighted average exposure level (**TWA**) refers to the average airborne concentration of a substance during a normal eight to ten hour workday. Some substances have recommended short-term exposure limits (**STELs**) or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from brief high exposures.

Indoor Air Quality

The criteria noted above (the NIOSH RELs, OSHA PELs, and ACGIH TLVs) are based upon health effects as they pertain to the industrial environment and may not have the same relevance for workers whose primary concern may be for comfort or simply an absence of unusual sensory stimuli over their working period.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (**ASHRAE**) ventilation guidelines for acceptable indoor air quality and comfort guidelines have been developed for the indoor environment.[6,7]

In addition, a screening method which is currently used by NIOSH for evaluating the adequacy of ventilation to an area is the measurement of CO_2 concentrations. People expire significant quantities of carbon dioxide. Generally, the higher these levels are in a building, the poorer the overall ventilation.

The bases for monitoring carbon dioxide, temperature, and relative humidity presented below:

Carbon Dioxide (CO_2)

CO_2 is a normal constituent of exhaled breath and, if monitored, can be used as a screening technique to evaluate whether adequate quantities of fresh air are being introduced into an occupied space. The ASHRAE Standard 62-1989, Ventilation for Acceptable Indoor Air Quality, recommends outdoor air supply rates of 20 cubic feet per minute per person (cfm/person) for office spaces and conference rooms, 15 cfm/person for reception areas, and 60 cfm/person for smoking lounges, and provides estimated maximum occupancy figures for each area.[6]

Indoor CO_2 concentrations are normally higher than the generally constant ambient outdoor CO_2 concentration (range 300-350 ppm). When indoor CO_2 concentrations exceed 1000 ppm in areas where the only known source is exhaled breath, inadequate ventilation is suspected. CO_2 concentrations in this range do not represent a health hazard. However, they do indicate that the air concentrations of other contaminants normally present in office environments may also be elevated and, in combination, may be contributing to employee health complaints.

Temperature and Relative Humidity

The perception of thermal comfort is related to one's metabolic heat production, the transfer of heat to the environment, physiological adjustments, and body temperatures. Heat transfer from the body to the environment is influenced by factors such as temperature, humidity, air movement, personal activities, and clothing. ANSI/ASHRAE Standard 55-1981 specifies conditions in which 80% or more of the occupants will find the environment thermally comfortable.[7]

The 1987 ASHRAE Handbook states that workers at a high rate of activity prefer 63 - 66°F dry bulb, with 20 to 50% relative humidity.[8] In addition, there is a need to provide fresh outside air to areas of the plant where workers are likely to be found. In such areas, a supply rate of 2 cubic feet per minute (**cfm**) per square foot (**ft^2**) of floor area is recommended. For maximum comfort, the air should be supplied at a height of about ten feet above floor level. While individuals vary in their perceptions of thermal comfort, if significant numbers of workers in an area complain, then temperatures and relative humidity may be creating an uncomfortable environment. If temperatures are too warm, complaints of tiredness, lack of concentration and headache may also be reported. Low relative humidity, not uncommon in the winter in a building that is not humidified, can cause eye, nose, and throat irritation.[9]

Paper Dust

Cellulose (paper) dust is considered a nuisance dust. The current OSHA PEL for nuisance dust (particulates not otherwise regulated) is 15 milligrams per cubic meter (**mg/M^3**).[5] These criteria were established to minimize mechanical irritation of the eyes and nasal passages, and to prevent visual interference. NIOSH has not developed specific criteria for total or respirable particulates.

Newsprint Inks

Over the years, newsprint ink formulations have evolved in an effort to achieve quicker drying, less misting, and better print quality. The major components, however, have not changed. These include an oil vehicle (usually mineral oil, although soybean oil-based inks are now available), carbon black or colored pigments, varnishes, and wetting agents.

Mineral oils can contain a complex mixture of aromatic, naphthenic, and straight- or branched-chain paraffinic hydrocarbons. The composition of a given oil depends upon the way in which the oil was processed, and the degree to which it was processed. Generally, more extensive processing results in better removal of the aromatic fraction of the oil, which contains polynuclear aromatic hydrocarbons (**PAHs**), substances considered to be potential carcinogens. Little information is available concerning the type of oil, carbon black, or additives used in inks at printing plants where previous epidemiological studies were conducted. Carbon black has been shown to adsorb PAHs, and extracts of carbon black have demonstrated carcinogenic activity.

The type of production method is thought to affect the PAH content of the carbon black. The significance of the mineral oil component of newsprint inks in converting the carbon black-associated PAHs into solution is not known at this time.

Environmental evaluation criteria for mineral oil mist have been established by ACGIH and OSHA, at 5 mg/M^3 as an eight-hour TWA.[4,5] This criterion was established to minimize respiratory irritation and pulmonary effects. The NIOSH REL for oil mist is 5 mg/M^3, with a

STEL of 10 mg/M^3. The current REL for carbon black is 3.5 mg/M^3 as a ten-hour TWA and, where PAHs are present, 0.1 mg/M^3.[3] The OSHA PEL for carbon black is 3.5 mg/M^3 as an eight-hour TWA.[5] Worker exposures to carbon black were not directly evaluated in this study.

Diesel Exhaust Emissions

Diesel engines function by facilitating the combustion of liquid fuel without spark ignition. Air is compressed in the combustion chamber, fuel is introduced, and ignition is accomplished by the heat of compression.

The emissions from diesel engines consist of a complex mixture, including gaseous and particulate fractions. The composition of the mixture varies greatly with fuel and engine type, load cycle, maintenance, tuning, and exhaust gas treatment. The gaseous constituents include carbon dioxide, carbon monoxide, nitric oxide, nitrogen dioxide, oxides of sulfur, and hydrocarbons (e.g., ethylene, formaldehyde, methane, benzene, phenol, 1,3-butadiene, acrolein, and polynuclear aromatic hydrocarbons).[10,11,12,13] The particulate fraction (soot) is composed of solid carbon cores, produced during the combustion process, which tend to combine to form chains of particles or aggregates, the largest of which are in the respirable range (more than 95% are less than 1 micron in size).[14] Estimates indicate that as many as 18,000 different substances resulting from the combustion process may be adsorbed onto these particulates.[15] The adsorbed material contains 15 - 65% of the total particulate mass and includes such compounds as polynuclear aromatic hydrocarbons, a number of which are known mutagens and carcinogens.[13,14,16]

Many of the individual components of diesel exhaust are known to have toxic effects. The following health effects have been associated with some of the components of diesel exhaust emissions: 1) pulmonary irritation from oxides of nitrogen, 2) irritation of the eyes and mucous membranes from sulfur dioxide, phenol, sulfuric acid, sulfate aerosols, and acrolein, and 3) cancer in animals from polynuclear aromatic hydrocarbons.

Several recent studies confirm an association between exposure to whole diesel exhaust and cancer in rats and mice.[17] The lung has been identified as the primary site of carcinogenic or tumorigenic responses following inhalation exposure. Limited epidemiological evidence suggests an association between occupational exposure to diesel exhaust emissions and lung cancer.[17] The agreement of current toxicological and epidemiological evidence suggests that occupational exposure to diesel exhaust is a potential carcinogen.[14] Tumor induction is associated with diesel exhaust particulates, and limited evidence suggests that the gaseous fraction of diesel exhaust may be carcinogenic as well.[14]

This investigation focused on oxides of nitrogen and aldehydes as markers of diesel exhaust exposure. The current OSHA PEL and NIOSH REL for nitrogen dioxide (**NO_2**) are 1 ppm as a fifteen-minute STEL.[3,5] The OSHA PEL for nitric oxide (**NO**) is 25 ppm as an eight-hour TWA.[5] The REL for NO is 25 ppm for a ten-hour TWA.[3] The ACGIH TLVs for NO_2 and NO are 3 ppm as an eight-hour TWA and 5 ppm as an STEL for NO_2, and 25 ppm as an eight-hour TWA for NO.[4] The OSHA PEL for formaldehyde is 1 ppm as an eight-hour TWA, with a 2 ppm fifteen- minute STEL.[5] The NIOSH REL for formaldehyde is 0.016 ppm as an eight-hour TWA, with a fifteen-minute ceiling limit of 0.1 ppm (this REL represents the lowest reliably quantifiable concentration).[3] The ACGIH TLV for formaldehyde is 1 ppm as an eight-hour TWA, with a fifteen-minute STEL of 2 ppm.[4]

NIOSH recommends that whole diesel exhaust be regarded as a "potential occupational carcinogen," as defined in the Cancer Policy of the Occupational Safety and Health Administration (OSHA) ("Identification, Classification, and Regulation of Potential Occupational Carcinogens," 29 CFR 1990). This recommendation is based on findings of carcinogenic and tumorigenic responses in rats and mice exposed to whole diesel exhaust. Though the excess risk of cancer in diesel-exhaust-exposed workers has not been quantitatively estimated, it is logical to assume that reductions in exposure to diesel exhaust in the work place would reduce the excess risk.[14]

VI. RESULTS

Newsprint Dust

Eight-hour TWA dust concentrations ranged from 0.01 mg/M^3 to 0.32 mg/M^3 for nineteen samples. The twentieth sample was overloaded with loose particulate and discarded. These results indicate that the concentration of newsprint dust in the air is less than the OSHA PEL, and ACGIH TLV.[4,5]

Ink Mist

The amounts of ink mist in fifteen samples were below the limit of detection (40 micrograms/filter [**ug/filter**]), and were below the limit of quantitation (120 ug/filter) in the remaining five samples. Therefore, the concentration of ink mist in air was less than the exposure criteria established by NIOSH, OSHA and ACGIH.[3,4,5]

Temperature and Relative Humidity

Dry bulb temperatures ranged from 71 to 85 °F. The outside temperature at 1:10 am was 37 °F. Relative humidity ranged from <10% to 23%. The outside relative humidity was 64% at 1:10 am. These temperatures are warmer, and the humidity is lower, than those conditions that ASHRAE found preferable by active workers.[8]

Carbon Dioxide

Carbon dioxide concentrations ranged from 450 to 625 ppm. Concentrations outside the front of the Broad Street entrance to the building were 450 ppm at 1:10 am and 450 ppm at 3:18 am. In light of the fact that in winter, fresh air is introduced by infiltration alone, the relatively low CO_2 levels indoors may have resulted from the fact that there were only sixty-five employees in a large space.

Hydrocarbons

The charcoal tube from the ink room was analyzed by GC-MSD. Compounds identified included toluene, xylenes, benzene, 1,1,1 - trichloroethane, various C_6-C_{13} alkanes, and C_9H_{12} molecular-weight-120 aromatics such as trimethylbenzenes. All contaminants were present at very low levels.

Based upon the results of this charcoal tube sample, the other two charcoal tube samples were quantitatively analyzed for benzene, toluene, xylene, and naphtha. The samples were analyzed by flame ionization gas chromatography according to NIOSH methods 1501 and

1550, except that a 30-m fused-silica capillary column containing the phase SPB-1 was used.[2] No benzene was detected on either of the tubes. The amounts of toluene, xylene, and naphtha for the sample collected by column C-3 were below the limit of detection (xylene) or between the limit of detection and the limit of quantitation (toluene and naphtha). For the sample collected at column E-8, the concentration of toluene was 0.22 ppm for an eight-hour time-weighted average, the concentration of xylene was between the limit of detection and the limit of quantitation, and the concentration of naphtha was 0.20 ppm as an eight- hour TWA. These concentrations are well below the relevant criteria established by OSHA, NIOSH, and ACGIH.[3,4,5]

Diesel Exhaust Emissions

No peaks other than those associated with blank tubes were detected on any of the Orbo-23 tubes, and no oxides of nitrogen were detected. These results indicate that, at the time sampling took place, workers in the track six mail room were not at risk of exposure to measurable amounts of diesel exhaust emissions.

VII. CONCLUSIONS

Air sampling results did not indicate any contaminants in levels which could be considered unacceptable. It should be emphasized that while this represents the exposures only on the night of the site visit, the time was chosen, after consulting with the requestor, to represent a worst-case exposure situation, when Christmas sales would lead to a high volume of circulars and the ventilation system would be shut down for the winter. Of the fourteen workers interviewed, seven (50%) reported upper respiratory and/or eye irritation that worsens while they are at work. Caution should be used in interpreting these data due to the small number of persons interviewed; the rate of symptoms among the entire workforce may be lower or higher than was reported by the interviewees. Temperature and relative humidity levels indicate that there is a need to reduce the temperature, increase the humidity, and introduce outside air in the winter months through mechanical means, rather than to rely only on infiltration, which invites the unwanted introduction of odors from the loading dock, and leads in part to the warm, dry conditions in the track six mail room. The workers' symptoms may be due to these conditions. Outside temperatures colder than the night of the survey may result in detectable concentrations of diesel exhaust emissions entering the track six mail room as a result of a tendency among drivers to leave trucks idling in cold weather and the reported tendency of exhaust emissions to remain in the loading dock area in very cold weather.

VIII. RECOMMENDATIONS

1. The local exhaust ventilation system at the battery charging station should be modified to place the exhaust inlets closer to the batteries. Smoke tube tests demonstrated ineffective capture in the system's current configuration.

2. Similarly, the local exhaust ventilation system on the loading dock is ineffective because the inlets are located over the docks, a trailer length away from the source of the emissions on semi-trailer tractors, and high above the tail pipe on delivery vans. Smoke tube tests showed that one half of the system was not operating properly on the night of the survey. The system could be modified to place the exhaust inlets closer to the emission sources.

3. The air conditioning system's fans should be cycled on and off periodically during operations in winter months to bring fresh outside air into the track six mail room. Insure that the fresh air intake is clear of any sources of odors or contaminants.

4. Empty garbage receptacles in the garbage storage room more frequently, and clean the floor in the room periodically to control odors and reduce employee complaints.

5. Complaints of diesel exhaust odors may be dealt with in several ways:

   a. Place the track six mail room under a slight positive pressure to prevent the infiltration of odors from the loading dock.

   b. Strictly enforce the requirement to turn off truck engines in the loading dock.

   c. Install supply outlets around doors to create an "air curtain" to prevent odors from entering.

IX. REFERENCES

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3. Philadelphia Newspapers, Inc., Philadelphia, Pennsylvania
4. OSHA, Region III

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

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