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A.W. CASH VALVE MANUFACTURING CORP.
DECATUR, ILLINOIS

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I. SUMMARY

On August 26, 1988, the National Institute for Occupational Safety and Health (NIOSH) received a request from the Allied Industrial Workers of America (AIWA), Region VIII, to evaluate potential employee exposures to lead from brass casting during use of the Dedicated Goss machines, crystalline silica (nuisance dust) during shot blasting, and freon during the reclamation process at the A.W. Cash Valve Manufacturing, Corp. This request was made after additional areas of concern were identified during a previous health hazard evaluation (HETA 88-242) on June 14-15, 1988. The A.W. Cash Valve Manufacturing, Corp. manufactures precision valves, including those for cryogenic uses with oxygen.

On February 16, 1989, a NIOSH investigator conducted environmental sampling for lead, crystalline silica, Freon 113, and trichloroethylene. Because this environmental monitoring showed that a potential for employee exposures to lead existed, NIOSH returned to the facility on August 8-9, 1989, to conduct biological (blood) monitoring and additional environmental sampling for lead.

During the survey on February 16, 1989, five general area air and two personal breathing zone samples for lead were collected from a Computer Numerically Controlled (CNC) machine and its operator. Four area air samples for Freon 113 from the reclamation still and two area air samples for trichloroethylene and Freon 113 from a degreaser loading area were also collected. In addition, total (3 samples) and respirable (6 samples) dust samples for silica were collected during the shot blasting operation.

The results for the lead sampling showed that there were potential employee exposures. The five general area air samples ranged from 32 to 120 micrograms per cubic meter of air (ug/m^3). The two personal breathing zone samples indicated employee exposure to airborne lead at 87 and 94 ug/m^3. Of these, two personal breathing zone and two area samples for lead were above the OSHA permissible exposure limit (PEL) of 50 ug/m^3 for an 8-hour time weighted average (TWA). The results for the Freon 113 and trichloroethylene sampling were all below their respective evaluation criteria. Analysis of the total and respirable dust samples showed that crystalline silica was not present. Therefore, these samples were considered to contain only nuisance dust; these samples were also all below their respective evaluation criteria.

On August 8-9, 1989, NIOSH returned to administer questionnaires and to conduct biological (blood) monitoring and additional air sampling for lead. Twenty-seven out of thirty potentially exposed employees agreed to participate in the biological monitoring portion of this survey. For technical reasons, blood samples could not be obtained from two of these participants. Twenty-four personal breathing zone and area samples for airborne lead were collected. The personal breathing zone samples were collected from 20 employees who had also volunteered for the biological monitoring. Four area air samples were also collected near machines that were considered to have a high potential for generating airborne lead. No area sample was collected from the CNC machine that was monitored during the February survey, because it had been converted from a dry to a wet process. However, a personal breathing zone sample was collected from the operator of this machine (3 ug Pb/m^3).

Of the 25 workers tested for blood lead (PbB) and free erythrocyte protoporhyrin (FEP), 23 had a blood lead level below 20 ug/dl (The general population mean is less than 15 ug/dl). The other 2 had blood lead levels of 30 and 33 ug/dl; one of them had an FEP level of 52 ug/dl. All other FEP levels were less than 50 ug/dl, the upper limit of normal for the general population. The 2 highest blood lead levels were in a Dedicated Goss operator (air lead level 29 ug/dl) and an Auto-lathe operator (who had no personal breathing zone air sample).

The 24 personal breathing zone samples ranged from non-detected to 29 ug/m^3, while the area air samples ranged from non-detected to 20 ug/m^3. Only four of the 20 personal samples and three of the four area samples had detectable quantities of lead (limit of detection: 3 ug/m^3). Only one personal breathing zone sample had a lead concentration (29 ug/m^3 in a Dedicated Goss operator) above 6 ug/m^3, the limit of quantitation (LOQ). Two area samples, both collected at the Dedicated Goss, had levels (8.9 and 20 ug/m^3) above the LOQ.

Based on the data collected during this evaluation, NIOSH investigators concluded that, at the time of the August survey, there was not a health hazard from occupational lead exposure. However, the environmental results indicate that the dry machining processes (those which do not use a cooling and lubricating spray), particularly the Dedicated Goss machine, are a potential lead exposure hazard. Minor modifications, described in section VIII, to these processes should control this problem.

KEYWORDS: SIC 3491 (Industrial Valves), lead, blood lead, Freon 113, silica, trichloroethylene, degreasing, shot blasting, reclamation, machine shops.

II. INTRODUCTION

On August 26, 1988, NIOSH received a request for a health hazard evaluation at the A.W. Cash Valve Manufacturing Corporation. This evaluation was conducted in response to a request by the Allied Industrial Workers of America (AIWA) after additional areas of concern were identified during a previous NIOSH health hazard evaluation (HETA 88-242) on June 14-15, 1988. In their request, the AIWA expressed concern about potential employee exposures to lead from brass castings during use of the Dedicated Goss machines, crystalline silica (nuisance dust) during shot blasting, and Freon 113 during the reclamation process. Subsequently, NIOSH visited the plant on February 16 and August 8-9, 1989.

Results of the lead samples collected during the Februrary 16th survey revealed a potential for employee exposures to lead from the machining of brass castings. The August 8-9 survey was conducted to further evaluate lead exposure via airborne lead and biological (blood level and free erthyrocyte protoporphyrin) monitoring. Also, NIOSH was requested to reinspect the pipe lagging in the Walrus Building because of concerns that its condition had deteriorated since the first health hazard evaluation (HETA 88-242). Samples were also collected at the degreasing process for trichloroethylene and Freon 113 for comparison to NIOSH's previous results to determine if engineering controls were effective.

III. BACKGROUND

The A.W. Cash Valve Corporation manufactures precision valves, including those for cryogenic uses with oxygen. Stainless steel and brass castings are received from other manufacturers. These castings are manufactured to their final form by a variety of machining processes. These processes include milling, drilling, lathe operations, and tapping on many types of machines with both wet and dry methods. The wet methods use a water-based coolant and lubricant during the machining process. The major concern during these operations is potential employee exposure to lead from the machining of the brass parts. Two machines, the Dedicated Goss and DeLeeuw (764), are of particular concern because they use dry machining methods. Threads are tapped into the valves during their operation. After the castings are machined, many are also shot blasted. This process removes metal shavings and chips left over from the machining processes. The castings are placed in a glove box and the operator manually cleans the castings with a pressurized spray of very fine glass beads. The concern here is the operator's potential exposure to dust, possibly crystalline silica, generated by the process.

The machined parts are routinely degreased with trichloroethylene to remove any residual lubricants or coolants. The company had recently installed an automated Detrex* degreaser system to limit worker exposures to trichloroethylene. The Detrex* degreaser system encompasses two areas. The first area houses a vapor degreaser and a robot, which are fully enclosed in a separately ventilated room under constant negative pressure. The second area consists of a conveyor system and an electric winch, with which workers load and unload large baskets of castings. Once the baskets are attached to the winch, the system is automatic, and the robot transfers the baskets to the enclosed degreaser and performs the degreasing operation. After completion, the robot returns the basket to the loading area and the workers remove the baskets from the winch. The castings are then inspected to determine if they need to be degreased again. The only time that the enclosed degreaser area is entered by employees is for maintenance. Three ultra-sonic degreasing units are used for fine cleaning of certain parts with trichloroethylene. These units are all located in the general work area of the plant. Parts that need fine cleaning are placed in a basket and hand-dipped into the ultra-sonic units. All degreasing units are covered when not in use and are equipped with local exhaust ventilation consisting of a slotted rim around their openings. Once the castings have been cleaned, they are assembled and inspected before being shipped.

Freon 113 is used in many areas of the plant, including the machining areas, to degrease parts before initial inspection during certain processes. Spent freon is collected and cycled through a reclamation still, which removes contaminants. One employee works in the area containing the freon still.

IV. METHODS

A. ENVIRONMENTAL

During the February 16th survey, personal breathing zone and general area air samples for lead, crystalline silica, trichloroethylene and Freon 113 were collected. The lead samples were collected on cellulose ester membrane filters attached via flexible tubing to Gilian* hi-flow personal sampling pumps calibrated at 2 liters of air per minute (lpm). These filters were analyzed by atomic absorption spectroscopy according to NIOSH Method 7082.[1] Five general area air samples were collected at the CNC machine #735, and two personal breathing zone samples were collected from its operator.

The samples for Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane) and trichloroethylene were both collected on charcoal tubes attached via flexible tubing to low-flow personal sampling pumps calibrated at 200 milliliters of air per minute (ml/min). These charcoal tubes were analyzed by gas chromatography according to NIOSH Methods 1022 and 1020.

Both total and respirable dust samples for silica were collected using 5-micron polyvinyl chloride (PVC) membrane filters with flow rates of 2.0 lpm and 1.7 lpm, respectively. A 10-mm nylon cyclone was used with the filters to collect the respirable fraction of dust. Both the total and respirable samples were analyzed gravimetrically according to NIOSH Method 0500, while the respirable dust samples were also analyzed by X-ray diffraction for crystalline silica (cristobalite and quartz content) according to NIOSH Method 7500.

During the August 8-9th follow-up survey, personal breathing zone and general area air samples for lead were collected in the same manner as previously described. Twenty personal breathing zone samples were collected from 25 employees who participated in the biological monitoring. Four area air samples were also collected near the Dedicated Goss and #764 DeLeeuw machines. These machines were considered to have a high potential for generating airborne lead, because they were not equipped with water sprays to suppress dust.

B. MEDICAL

Medical monitoring and evaluation consisted of blood lead (PbB) and free erythrocyte protoporphyrin (FEP) determinations on 25 workers from three departments of this facility (machine shop, production, and assembly). A questionnaire was administered to all participants to obtain demographic information and current medical and occupational histories.

Workers selected for inclusion in this evaluation were those identified as having potential for exposure to lead as a result of machining of brass parts in the manufacturing process. A group of thirty employees was identified by management and union representatives. Twenty-seven of these 30 workers agreed to participate in the biological monitoring and questionnaire portion of this survey. For technical reasons, blood samples could not be obtained from two of these participants. The blood samples were analyzed by an OSHA approved laboratory. Blood lead values were determined by anodic stripping voltametry method with a limit of detection of 5 ug/dl. The free erythrocyte protoporphyrin concentrations were determined by the fluorometric method and had a limit of detection of 0.1 ug/dl.

V. EVALUATION CRITERIA

As a guide to the evaluation of the hazards posed by workplace 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 up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects even though 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 substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increase 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 workplace are: 1) NIOSH Recommended Exposure Limits (RELs)[2], 2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLVs)[3], and 3) the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs)[4]. Often the NIOSH RELs and ACGIH TLVs are lower than the corresponding OSHA PELs. Both NIOSH RELs and ACGIH TLVs are usually based on more recent information than are the OSHA PELs. The OSHA PELs also may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH RELs, by contrast, are based primarily on concerns relating to the prevention of occupational disease. In evaluating the exposure levels and the recommendations for reducing these levels found in this report, it should be noted that the lowest standard was used; however, industry is legally required to meet those levels specified by the OSHA standard.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8- to 10-hour workday. Some substances have recommended short-term exposure limits (STEL) or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from high short-term exposures.

A. LEAD

Inhalation (breathing) of lead dust and fume is the major route of lead exposure in industry. A secondary source of exposure may be from ingestion (swallowing) of lead dust deposited on food, cigarettes, or other objects. Once absorbed, lead is excreted from the body very slowly. Absorbed lead can damage the kidneys, peripheral and central nervous systems, and the blood forming organs. Chronic lead exposure is associated with infertility and with fetal damage in pregnant women. There is some evidence that lead can also impair fertility in occupationally exposed men.[5,6]

The blood lead test is one measure of the amount of lead in the body and is the best available measure of recent lead absorption. Adults not exposed to lead at work usually have a blood lead concentration less than 30 ug/dl; the average is less than 15 ug/dl.[7,8] In 1985, the Centers for Disease Control (CDC) recommended 25 ug/dl as the highest acceptable blood level for young children.[9] Since the blood lead concentration of a fetus is similar to that of its mother, and since the fetus's brain is presumed to be at least as sensitive to the effect of lead as a child's, the CDC advised that a pregnant woman's blood lead level be below 25 ug/dl.[9] Recent evidence suggests that the fetus may be adversely affected at blood lead concentrations well below 25 ug/dl.[10] Furthermore, there is evidence to suggest that levels as low as 10.4 ug/dl affect the performance of children on eductional attainment tests, and that there is a dose-response relationship with no evidence of threshold or safe level.[11] Lead levels between 40-60 ug/dl in lead exposed workers indicate excessive absorption of lead and may result in some adverse health effects. Levels of 60-100 ug/dl represent unacceptable elevations which may cause serious adverse health effects. Levels over 100 ug/dl are considered to be extremely dangerous and often require hospitalization and medical treatment.

The OSHA PEL for lead in air is 50 micrograms per cubic meter (ug/m^3) of air calculated as an 8-hour time-weighted average for daily exposure. This regulation also requires semi-annual blood lead monitoring of employees exposed to 30 ug/m^3 or more of lead. An employee whose blood lead level is 40 ug/dl or greater must be retested every two months and be removed from a lead-exposed job if the average blood lead level is 50 ug/dl or more over a 6-month period. A blood lead level of 60 ug/dl or greater, confirmed by retesting within two weeks, requires immediate medical removal. Workers on medical removal should not be returned to a lead-exposed job until their blood lead level is confirmed to be below 40 ug/dl. The standard also recommends that the blood lead levels of employees planning to have children should be kept below 30 ug/dl. Removed workers have protection for wage, benefits, and seniority for up to 18 months until their blood levels decline to below 40 ug/deciliter and they can return to lead exposure areas.[5]

The free erythrocyte protoporphyrin (FEP) level is a measure of interference with hemoglobin production at the time the red blood cells are made affecting heme synthetase, the last enzyme in heme synthesis. Although some diseases and iron deficiency anemia can cause a rise in FEP, in a healthy individual working with lead, lead absorption is the most likely cause for such an increase. Further, the FEP levels increase abruptly when blood levels reach about 40 ug/dl, and they tend to stay elevated for 3-4 months (the average life span of a red cell). Normal values are below 50 ug/dl.

B. TRICHLOROETHYLENE

The predominant physiological response to trichloroethylene (TCE) is one of central nervous system depression. This is particularly true as a response to acute or short-term exposure. Visual disturbances, mental confusion, fatigue, and sometimes nausea and vomiting have been observed. Prolonged skin contact may cause local irritation and blister formation. Under industrial conditions, repeated emersion of the hands in TCE has caused paralysis of the fingers. While TCE will penetrate intact skin, it is unlikely that absorption of large quantities would occur by this route. TCE is also absorbed readily from the gastrointestinal tract. Liver and kidney injuries in humans attributable to overexposure to TCE are rare.[12]

Intolerance to alcohol is also a well-characterized phenomena among TCE-exposed workers. Not only do many TCE workers become inebriated with consumption of small quantities of alcoholic beverages, but they also are subject to vasodilatation of superficial skin vessels, resulting in skin blotches, a condition known as "degreaser's flush". This flushing is most prominent on the face, neck, shoulders, and back. This condition appears to be a benign dermal phenomenon of short duration but has been observed to last for up to 6 weeks after exposure to TCE for 5 days at 200 parts per million (ppm).

On March 21, 1975 the National Cancer Institute reported preliminary results of a carcinogen bioassay which indicated no carcinogenic effects in rats but the induction of hepatocellular carcinomas in mice. After reviewing the NCI study, NIOSH recommended that TCE be considered a suspect human carcingen and transmitted this message to the public via a Current Intelligence Bulletin.[13] The ACGIH TLV and the final OSHA PEL for trichloroethylene have both been set at 50 ppm, with a short-term exposure limit (STEL) of 200 pmm, while the transitional OSHA PEL is 100 ppm with a ceiling limit also at 200 ppm. OSHA permits the use of any compliance methodology, until December 31, 1992, to achieve the final PEL. During this period, however, the established OSHA hierarchy of controls with preference for engineering controls will also be applied to achieve the level of the transitional PELs. NIOSH considers a level of 25 ppm, as a TWA, to be uniformly achievable by the use of existing engineering control technology. However, since there is no known safe level of exposure to a carcinogen, the goal should be to minimize exposure to the lowest extent possible.

C. 1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE (FREON 113)

Freon 113 is low in acute oral toxicity. Animal studies also indicate a low acute toxicity when Freon 113 is inhaled. Freon 113 acts like a weak central nervous system depressant and has a relatively strong cardiac sensitization potential compared to homologous fluorocarbons. Other effects seen with massive doses are irritation of the respiratory tract and liver cell enlargement. Exposures to human volunteers indicate that the threshold concentration for impairment of psychomotor performance (loss of ability to concentrate, mild lethargy) is about 2500 ppm. Daily six-hour exposures at 500 or 1000 ppm, five days a week for two weeks, yielded no complaints of adverse effects except mild throat irritation only on the first day. No adverse changes were seen in performance of complex mental tasks, clinical status, or results of biochemical tests.[14] Freons have been reported to sensitize the heart to the body's own epinephrine (adrenaline) and to beta-adrenergic agonist drugs (drugs which work by similar mechanisms as adrenaline). This sensitization can cause increased potential for cardiac arrhythmias, which are disruptions of the normal heart beat.[15] Freon 113 is presently under review by the ACGIH; meanwhile a TLV of 1000 ppm, as a time-weighted average, and a STEL of 1250 ppm, are presently in place. This should provide a margin of safety for systemic effects and an adequate margin against cardiac sensitization. The OSHA PEL for Freon 113 is also 1000 ppm.

D. NUISANCE DUST

The OSHA PEL for inert or nuisance dust is 15 milligrams per cubic meter (mg/m^3) of air for total dust, and 5 mg/m^3 for the respirable fraction, for an 8-hour time-weighted average. The respirable fraction of particles are those with an aerodynamic diameter of 10 microns or less, capable of penetrating deep into the lungs when inhaled. The ACGIH has established a TLV for total dust, containing no asbestos and <1% crystalline silica, of 10 mg/m^3, 8-hour TWA. The ACGIH TLV is based on the experience that nuisance dusts generally have little adverse effect on the lungs and do not produce significant disease when exposures are kept under control.

VI. RESULTS AND DISCUSSION

A. ENVIRONMENTAL

The results of the air sampling conducted during the Februrary 16, 1989 survey are included in Table 1. The results for the 5 general area lead samples ranged from 32 to 120 ug/m^3. The two personal breathing zone samples indicated employee exposure to airborne lead at 87 and 94 ug/m^3, both of which are above the OSHA PEL.

Air samples for total and respirable silica samples were analyzed gravimetrically, while the samples for respirable silica were also analyzed by X-ray diffraction for cristobalite and quartz content. Neither cristobalite or quartz was detected in any of the samples; therefore, only the results from the gravimetric analysis have been used to report total (nuisance) and respirable dust concentrations. These ranged from 0.5 to 3.1, and 0.01 to 1.5 mg/m^3, respectively.

The results of the area sampling for Freon 113 during reclamation showed air concentrations ranging from 59 to 117 ppm. Samples were also collected for both Freon and trichloroethylene in the degreaser loading area. The air concentrations of trichloroethylene were 11 and 8.9 ppm, and the concentration of freon in both these samples was 1.4 ppm. These levels were all slightly higher than those detected the previous health hazard evaluation (HETA 88-242) conducted on June 14-15, 1988. The previous levels ranged from 0.65 to 3.6 ppm and non-dectectable to 0.45 ppm for the trichloroethylene and Freon 113, respectively.

The results for total dust, Freon and trichloroethylene were all below their respective evaluation criteria (see Table 1). Both of the personal breathing zone sample results for lead were above the OSHA PEL of 50 ug/m^3 for an 8-hour time-weighted average.

Twenty personal breathing zone and four area samples were collected for lead during the August 8-9, 1989. The personal breathing zone samples ranged from non-detected to 29 ug/m^3, while the area samples ranged from non-detected to 20 ug/m^3. Only four of the 20 personal samples and three of the four area samples had detectable quantities of lead (limit of detection at 3 ug/m^3). Of these four personal samples, only one had a lead concentration (29 ug/m^3) above 6 ug/m^3, the limit of quantitation (LOQ). This sample was collected from the operator of a Dedicated Goss machine, which was not equipped with a cooling and lubricating spray. Two of the area samples, both collected at the Dedicated Goss, had levels (8.9 and 20 ug/m^3) above the LOQ.

All personal breathing zone and area air lead concentrations were below the evaluation criteria. The result for the CNC machine #735 operator was approximately 3 ug/m^3, which was much lower than during the first survey. Additional area samples were not collected from this machine because it was operating with a cooling and lubricating spray. During the first survey, when the high lead levels were detected, it did not operate with this spray.

B. MEDICAL

Of the twenty-five workers tested for blood lead (PbB) and free erythrocyte protoporhyrin (FEP), 23 had a blood lead level below 20 ug/dl. (The general population mean is less than 15 ug/dl.) The other 2 had blood lead levels of 30 and 33 ug/dl; one of them had an FEP level of 52 ug/dl. All other FEP levels were less than 50 ug/dl, the upper limit of normal for the general population. The 2 highest blood lead levels were in a Dedicated Goss operator (air lead level 29 ug/dl) and an Auto-lathe operator (who had no personal air sample).

Mean PbB levels by department were: 1) machine shop - 11.7 ug/dl, 2) production - 14.1 ug/dl, and 3) assembly shop - 6.8 ug/dl. Using analysis of variance, comparisons of these mean PbB levels by department showed no significant statistical difference (F=1.52; p=0.24).

VII. CONCLUSIONS

Overall, the blood lead and FEP results did not demonstrate excessive occupational lead exposure. However, the environmental results indicate that the dry machining processes (those which do not use the cooling and lubricating spray), particularly the Dedicated Goss machine, are a potential lead exposure hazard. Minor modifications, included in the recommendations, to these processes should control the problem.

VIII. RECOMMENDATIONS

Preliminary recommendations made after our walk-through and subsequent survey of the areas identified in the request were included in a letter dated March 17, 1989. Additional recommendations are also made based on the air sampling and biological sampling results. All of these recommendations, presented below, will help to further reduce potential employee exposures.

1. The dry machining processes have the greatest potential for producing lead exposures when work with the brass castings is being done; therefore, these processes should be modified to wet processes. If this is not feasible, local exhaust ventilation should be provided at those machines with dry processes to remove any lead that becomes airborne. If local exhaust units are installed, additional air sampling would be needed to insure that they are performing adequately.

2. During periods when the brass castings are being extensively machined, additional air sampling for lead should be conducted, especially for the operators and areas near the machines with dry processes. If lead levels of 30 ug/m^3 or more are obtained, a lead program, including training and blood lead monitoring, may need to be developed in accordance with the OSHA lead standard, 29 CFR 1910.1025.

3. Workers throughout the plant were observed smoking while they work. As described in our report dated September 26, 1988, this could create a potential for both dermal and oral exposures, as well as being a potential fire hazard. Workers should not be allowed to eat or smoke at their work stations. A clean area should be created where workers can eat without being exposed to chemical hazards, especially the lead determined to be present. Also, the workers should be encouraged to practice good hygiene (e.g. thoroughly washing hands and face) before smoking or eating. If smoking is permitted, it should be restricted to designated locations, other than work areas or common-use areas. These smoking areas should have their air exhausted directly to the outdoors.

4. Some type of ventilation should be installed in the area of the Freon reclamation still to remove or dilute vapors produced in this area. Currently, this still is located in an area where insufficient air movement could allow vapors levels to build-up.

5. Safe handling practices should be used while working with the Freon. Since this chemical evaporates very rapidly, it should be kept in an appropriate sealed container that limits the amount of evaporation. Also, it should be used only in properly ventilated areas to limit exposures. Currently, it is being used in a metal can located in a non-ventilated cabinet.

6. The condition of the pipe lagging in the Walrus Building appeared to be deteriorating. Employees described visible dust releases as a result of fork-lifts contacting the pipes with items being moved in the storage area. Visilbe damage, possibly caused by such accidental contact, could be seen in some areas of the pipe lagging. The pipe lagging is of the corrigated paper type and was determined by a company consultant to contain chrysotile asbestos. Since visible releases have reportedly occurred, and the pipe lagging's condition has deteriorated, the potential for exposure to airborne asbestos fibers may exist. Therefore, the asbestos-containing pipe lagging should be removed instead of encapsulated (as suggested previously).

7. The recommendations for conrolling potential exposures at the degreaser that were presented previously in Health Hazard Evaluation Report No. 88-357 should be implemented. The need for corrective action was confirmed by the higher concentrations detected during this evaluation.

IX. REFERENCES

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XI. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are temporarily available upon request from NIOSH, Hazard Evaluations and Technical Assistance Branch, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. A.W. Cash Valve Manufacturing Corporation, Decatur, Illinois
2. Allied Industrial Workers of America, Region VIII
3. Allied Industrial Workers of America, Local 904
4. OSHA, Region V

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.

Table 1
Personal Breathing-Zone and General Area
Air Concentrations of Lead, Freon, Trichloroethylene, and Silica*
A.W. Cash Valve Manufacturing, Decatur, Illinois / HETA 88-357 / February 16, 1989

Sample Description	Contaminant (min.)	Sampling Time	Concentration
CNC Machine #735 Operator (PBZ)	Lead	282	87 ug/m^3
" "	282	94	"
On top of the CNC machine #735 (GA)	"	282	87 "
On top of the control panel (GA)	"	280	39 "
On the CNC machine at the open corner of the far end (GA)	"	278	32 "
On the CNC machine near the open corner (GA)	"	275	120 "
Across aisle from CNC (GA)	"	275	(9)**"
On wall near Reclaim Still (GA)	Freon	245	114 ppm+
On tester across aisle (GA)	"	245	117+ "
On the Reclaim Still (GA)	"	245	108+ "
On wall near Reclaim Still (GA)	"	156	59 "
In Degreaser loading area (GA)	Freon	236	1.4 "
	TCE	11 "	
In Degreaser loading area (GA)	Freon	237	1.4 "
	TCE	8.9 "	
Sand Blaster Operator (PBZ)	Total Dust*	65	2.0 mg/m^3
" Resp. Dust*	65	1.5 "	
"	"	55	0.11 "
Across from Sand Blaster (GA)	Total Dust	63	3.1 mg/m^3
" Resp. Dust	63	0.65 "	
"	"	63	1.0 "
Near side of Sand Blaster (GA)	Total Dust	60	0.50 "
" Resp. Dust	60	0.01 "	
"	"	60	0.01 "

Evaluation Criteria	NIOSH	ACGIH	OSHA
Lead	50 ug/m^3	150 ug/m^3	50 ug/m^3
Freon (1,1,2-trichloro-1,2,2-trifluoroethane)	No current NIOSH REL	1,000 ppm	1,000 ppm
Trichloroethylene	25 ppm++	50 ppm	50 ppm
Total Dust (Amorphous silica)	No current NIOSH REL	10 mg/m^3	15 mg/m^3
Respirable Dust	"	No current ACGIH TLV	5 mg/m^3

(PBZ) - Personal Breathing Zone sample
(GA) - General Area sample

* Because neither cristobalite or quartz were detected by x-ray diffraction, the values listed represent results obtained by gravimetric analysis. Therefore, these values represent total dust including amorphous silica and diatomaceous earth.

** Result between the limit of quantitation (13 ug/m^3) and the limit of detection (5.4 ug/m^3).

\+ Sorbent tube breakthrough occured with these samples; therefore, the value listed is a conservative estimate of the actual concentration.

++ Trichloroethylene is a chemical recommended by NIOSH to be treated as a potential human carcinogen, and exposures should be reduced to the lowest feasible level.