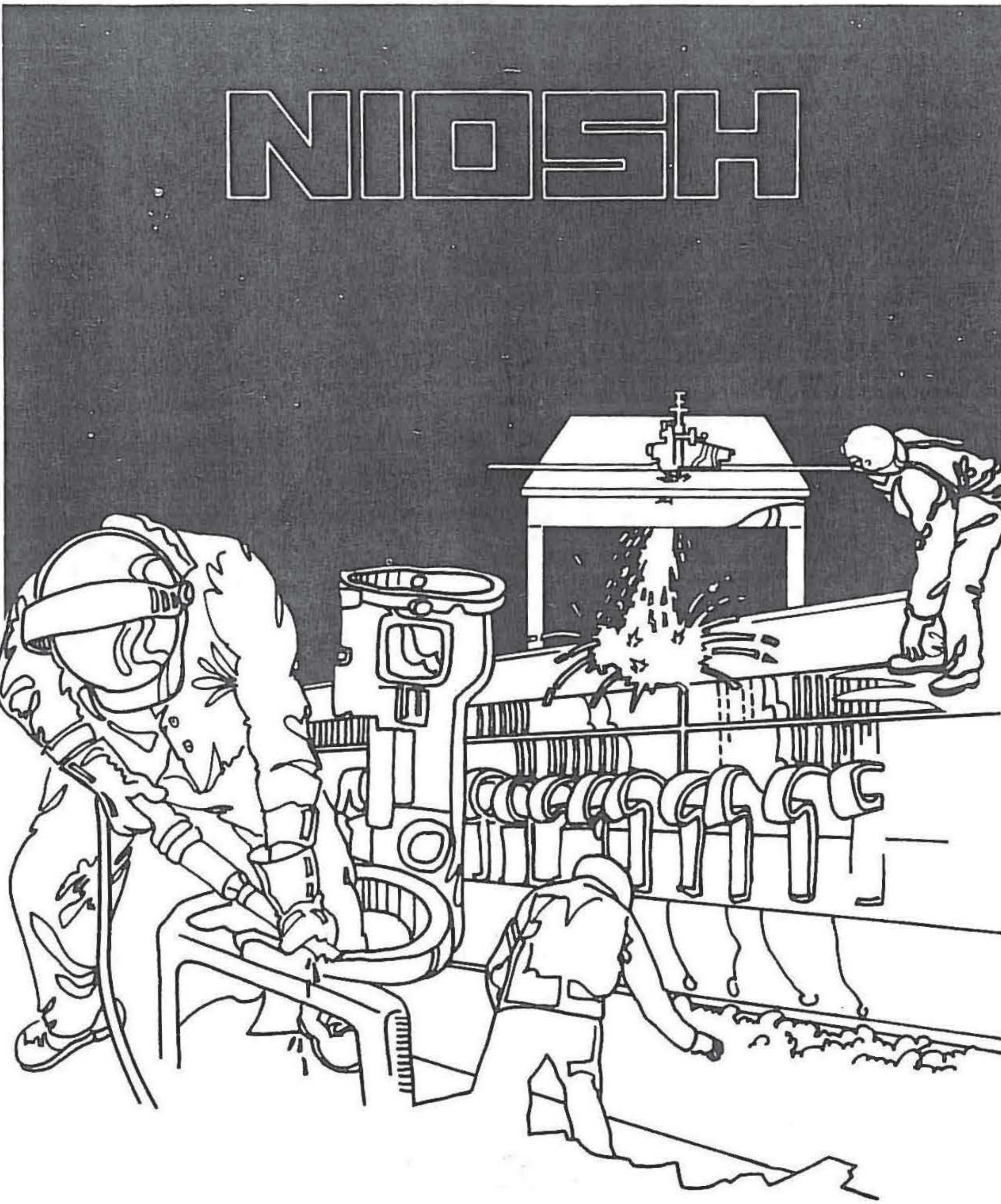
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
Centers for Disease Control ■ National Institute for Occupational Safety and Health



Health Hazard Evaluation Report

HETA 84-437-1532
PERRY NUCLEAR POWER PLANT
PERRY, OHIO

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.

HETA 84-437-1532
NOVEMBER 1984
PERRY NUCLEAR POWER PLANT
PERRY, OHIO

NIOSH INVESTIGATOR:
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I. SUMMARY

In July 1984, the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate the occupational exposure of workers to metal fumes and dusts during the construction of the Reactor Building at Perry Nuclear Power Plant, Perry, Ohio.

NIOSH investigators had conducted health hazard evaluations in the Reactor Building each of the two previous years (HETA 82-186-1203 and HETA 83-249). The earliest survey, (March 1982) had documented potential overexposure to iron, zinc, lead, nickel, quartz, and chromium. The second survey (May 1983) did not document any overexposure to asbestos, fibrous glass, respirable particulate, quartz, cristobalite, beryllium, iron, manganese, zinc, chromium, or particulate fluorides. However, one possible overexposure to nickel and two possible overexposures to arsenic were recorded.

On August 8, 1984, NIOSH industrial hygienists conducted personal breathing zone air monitoring for crystalline free silica (quartz and crystobalite), metal fumes and dust, and respirable particulate from workers engaged in pipe welding grinding and associated activities at the construction site.

Quartz exposures ranged from <24 ug/M^3 to 67 ug/m^3, with 1/3 (33%) exceeding the NIOSH recommended exposure limit of 50 ug/m^3. Crystobalite exposures were below the limit of detection (<25 ug/m^3). Total chromium (<7-10 ug/m^3), zinc (30-130 ug/m^3), iron (94-1617 ug/m^3), nickel (<4-4 ug/m^3), lead (<4 ug/m^3), and respirable particulate (411-1488 ug/m^3) exposures were all below their recommended exposure limits (50, 5000, 5000, 15, 50, 5000 ug/m^3, respectively).

Only one overexposure, to quartz at 67 ug/m^3, could be documented in this evaluation. Although previous evaluations had revealed potential overexposures to other contaminants as well as silica, it appears that as the construction has progressed toward completion, the number and degree of overexposures have declined. Silica overexposure in the absence of sandblasting or other operations using silica indicates that residual construction dust is still a problem. Recommendations for engineering control and improved housekeeping have been made previously. In light of evidence of residual silica dust exposure, improvements in housekeeping are reemphasized in Section VII of this report.

KEYWORDS: SIC 1541 (General Contractors - Industrial Buildings and Warehouses), metal fume, silica, construction sites, welding, grinding.

II. INTRODUCTION

In July 1984, NIOSH received a request for a health hazard evaluation from the authorized representative of Pipefitters Local 120 to assess the exposure of workers to airborne contaminants generated during construction of the Reactor Building at Perry Nuclear Power Plant, Perry, Ohio. On August 8, 1984, NIOSH industrial hygienists conducted a site visit.

III. BACKGROUND

Construction at the Perry Nuclear Power Plant began in 1977. The design of the reactor building, with limited access points, multi-tiered worksites, and high worker population density, is such that the contaminants generated by one work process; e.g., grinding, may result in exposure to nearby workers engaged in other tasks (painting, welding). The result is multiple exposure to a worker. It was this concern about exposures, occurring not directly related to the job being performed, that prompted this and the previous evaluation request.

In March 1982, NIOSH investigators conducted the first evaluation (HETA 82-186-1203) (1) of the construction activities in the Reactor Building. Personal breathing-zone air samples were collected for metal fume from welding and grinding operations, and solvent vapors from spray painting. In addition, air sampling data collected by a private consulting firm were reviewed.

Three personal breathing-zone air samples for metal contaminants during welding, arc gouging, and grinding were collected. Iron oxide concentrations ranged from 5400 to 9900 ug/M^3, and chromium concentrations ranged from 650 to 1100 ug/M^3. All three samples exceeded the evaluation criterion for iron oxide (5000 ug/M^3, nickel (15 ug/M^3), and chromium (25 ug/M^3).

Two personal breathing-zone air samples for xylene, methyl isobutyl ketone (MIBK), cellosolve, ethanol, and isopropanol were collected during spray painting with an epoxy paint. Assuming additivity, combined exposures were 88% and 93% of the evaluation criterion.

Twenty-two personal breathing zone air samples were taken by the consultants and analyzed specifically for chromium (VI). Concentrations ranged from less than 1 ug/M^3 to 270 ug/M^3, with a mean of 37 ug/M^3. Seven samples exceeded the evaluation criterion of 25 ug/M^3.

Nine personal breathing zone air samples were taken by the consultants during spray painting with "CZ-11" (a zinc-based paint containing 1% lead chromate). Zinc concentrations ranged from 700 to 17000 ug/M^3 with a mean of 5500 ug/M^3. Four samples exceeded the evaluation criterion of 5000 ug/M^3. Lead concentrations ranged from 6 to 170 ug/M^3 with a mean of 66 ug/M^3. Chromium concentrations ranged from less than 3 ug/M^3 to 53 ug/M^3 with a mean of 25 ug/M^3. Five samples exceeded the evaluation criterion of 50 ug/M3 for lead and seven samples exceeded the evaluation criterion 1 ug/M3 for chromium.

The consultants collected two personal breathing-zone air samples for respirable quartz during sandblasting. The two workers were exposed to concentrations of 85 and 87 ug/M^3. The evaluation criterion is 50 ug/M^3.

In May 1983, a second evaluation was made in the Reactor Building (HETA 83-249) (2). Personal breathing zone air samples were collected for metal fume and particulate fluoride from welding and grinding operations, and respirable dust, crystalline silica (quartz and cristabolite), and airborne fibers (asbestos and fibrous glass) from other, related activities. Potential overexposures to arsenic (<1-16 ug/M^3) and nickel (<1-51 ug/M^3) were recorded. The recommended exposure limits are 2 and 15 ug/M^3, respectively. However, these data are suspicious since sample tampering by workers was observed. Beryllium (all <0.3 ug/M^3), iron (29-795 ug/M^3), manganese (2-23 ug/M^3), zinc (19-59 ug/M^3), chromium (VI) (all <0.3 ug/M^3), and particulate fluoride (<20-37 ug/M^3) levels were all below the recommended exposure limits of 0.5, 5000, 1000, 5000, 1, and 2500 ug/M^3, respectively.

Total fiber levels (all <1 fiber/cubic centimeter air, f/cc) were below the recommended exposure limit for both asbestos (0.1 f/cc) and fibrous glass (3.0 f/cc). Quartz and cristabolite levels were below the sampling and analytical limit of detection (<49 ug/M^3). Respirable dust levels (100-500 ug/M^3) were below the recommended exposure limit of 5000 ug/M^3.

During this current evaluation, less welding and grinding occurred than in the previous studies. Also, no sandblasting occurred during this and the last evaluation.

IV. EVALUATION DESIGN AND METHODS

In order to select those workers judged most representative of the type and degree of work performed by pipefitters, union stewards selected workers who would be grinding, welding, and doing other tasks associated with pipefitter construction. Personal breathing zone air samples were collected according to standard NIOSH methods. Table 1 describes the sampling and analytical techniques employed.

There was a issue indirectly related to the job exposure, and that was whether or not the contaminant levels in general areas of the reactor building were low enough so that work break activities (eating, drinking, smoking) could be permitted. In order to assess this possibility, union stewards selected two areas - Drywell #3 and Wetwell #6 - meeting the following criteria: within reasonable access, (distance and time) of reactor building workforce and free of contaminant generating activities. Area air samples for metals, silica, and respirable particulate were collected in these areas. It was suggested by NIOSH investigators and agreed by management and labor beforehand that "acceptable break areas" would be free of toxic materials as defined by the Occupational Safety and Health Administration (OSHA) General Industry Standards (3) in 1910.141(2)(viii): "'Toxic Material' means a material in concentration or amount which exceeds the applicable limit established by a standard, such as 1910.1000 and 1910.1001 or, in the absence of an applicable standard, which is of such toxicity so as to constitute a recognized health hazard or is likely to cause death or serious physical harm." It was understood that these areas, if identified, would not be used as formal lunch areas, and that lunch breaks were required to be taken outside the Reactor Building.

V. EVALUATION CRITERIA

A. Environmental Criteria

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for 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 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 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 evaluation 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 Criteria Documents and recommendations, 2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLV's) (4,5), and 3) the U.S. Department of Labor (OSHA) occupational health standards. Often, the NIOSH recommendations and ACGIH TLV's are lower than the corresponding OSHA standards. Both NIOSH recommendations and ACGIH TLV's usually are based on more recent information than are the OSHA standards. The OSHA standards also may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH-recommended standards, 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 industry is legally required to meet only those levels specified by an 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 or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from high short-term exposures.

B. Specific Substances

1. Crystalline Silica(6)

The crystalline form of silica, silicon dioxide, is widely distributed in nature and constitutes a major portion of most rocks, soils, and sand. Much of the silica of naturally occuring rocks (i.e. bauxite, clay) is in the combined form, bound chemically with other mineral oxides. Free crystalline silica, such as quartz, cristobalite, and tridymite, is silica which is not combined with any other element or compound. The crystalline forms of silica can cause severe lung damage when inhaled. Silicosis is a form of pulmonary fibrosis caused by the deposition of fine particles of crystalline silica in the lungs. Symptoms usually develop insidiously, with cough, shortness of breath, chest pain, weakness, wheezing, and non-specific chest illnesses. Silicosis usually occurs after years of exposure, but may appear in a shorter time if exposures are very high. This latter form is referred to as rapidly-developing silicosis. Silicosis is usually diagnosed through chest X-rays, occupational exposure histories, and pulmonary function tests. The manner in which silica affects pulmonary tissue is not fully understood, and theories have been proposed based on the physical shape of the crystals, their solubility, toxicity to macrophages in the lungs, or their crystalline structure. There is evidence that cristobalite and tridymite, which have a different crystalline form from that of quartz, have a greater capacity than quartz to produce silicosis.

The OSHA standards for silica exposure recognize this difference in quartz and cristobalite in terms of health effects, with cristabolite having a lower limit. The standards are calculated, considering the percent quartz or cristobalite present in the dust, thusly:

$$\text{quartz:} \quad \frac{10 \text{ mg/m}^3}{\% \text{ SiO}_2 + 2}$$

$$\text{cristobalite:} \quad \frac{5 \text{ MG/M}^3}{\% \text{ SiO}_2 + 2}$$

The NIOSH criterion, to go one step further, considers all forms of free silica identical in terms of health effects and recommends a 50 ug/M^3 exposure limit, regardless of crystalline form.

2. Chromium(7,8)

Chromium compounds in the +6 oxidation state are the most toxic. Exposure to the skin can cause allergic contact dermatitis and skin ulcers. Airborne exposures to chromium (VI) compounds can cause irritation and ulceration of the nasal lining, and perforation of the nasal septum. Chromium (VI) exposure has also caused kidney damage, liver damage, pulmonary congestion and edema, and erosion and discoloration of the teeth.

Some of the chromium (VI) compounds have been associated with lung cancer while other commonly used compounds in this class have not been associated with the disease. Therefore, NIOSH has adopted two recommended exposure limits for chromium (VI) compounds. "Noncarcinogenic" chromium (VI) [such as chromium (VI) oxide] should be limited to 25 ug/m^3 as a time-weighted average (TWA) exposure for up to a 10-hour workday, 40-hour workweek. "Carcinogenic" chromium (VI) [such as lead chromate] has a recommended TWA standard of 1 ug/m^3. The American Conference of Governmental Industrial Hygienist (ACGIH) has recommended a threshold limit value of 500 ug/m^3 for chromium metal and those chromium compounds in the +2 and +3 oxidation states. The OSHA permissable exposure limit is 500 ug/m^3 for soluble chromic and chromous salts and 1000 ug/m^3 for chromium metal and its insoluble salts.

3. Nickel(9)

Airborne exposure to inorganic nickel compounds can cause erosion and perforation of the nose and impairment of the sense of smell. Skin exposure can cause allergic contact dermatitis and those workers who become sensitive to nickel may also develop asthma.

Epidemiology studies have shown that nickel refinery workers have an increased risk of lung, nasal, and kidney cancer. The nickel compounds most commonly found during refining are nickel sulfate, nickel sulfide, and nickel oxide but prudence dictates that all nickel compounds should be considered carcinogenic until further studies are conducted. NIOSH recommends that exposure be limited to 15 ug/m^3 TWA. The OSHA permissible exposure limit is 1 mg/m^3 for an 8-hour TWA exposure.

4. Iron Oxide(10)

Little or no physical disability appears to be caused by the presence of iron oxide dust in the lungs, although it cannot be assumed that it is harmless. The collection of iron oxide dust in the lungs has been found in workers with generalized discrete densities in the chest X-rays, and has been termed siderosis. Siderosis is considered a benign condition that does not progress to fibrosis. It generally requires six to ten years of exposure to iron oxide fume in order to produce it. No studies have been reported which would serve to correlate exposure levels to iron oxide and the occurence of X-ray changes in the lungs.

Siderosis has been found in welders with recent exposures below 10 mg iron oxide/m^3, but probable higher past exposures. In addition, exposures to iron oxide fume well over 10 mg/m^3 have been seen in arc air and powder-burning operations. X-rays revealed no significant changes, but there were relatively few long exposures and none over 12 years.

An exposure limit of 5 mg/m^3 for iron oxide fume is recommended to prevent the development of X-ray changes in the lungs on long-term exposure. Although these changes are not considered to be associated with any physical disability, they sometimes present problems in different diagnosis.

5. Other Metals

a. Zinc(11)

Zinc oxide fume is toxic by inhalation, although the precise mode of action upon the body is unknown. Excessive exposure can cause metal fume fever which usually occurs about four to six hours past exposure. Metal fume fever is characterized by the following symptoms: irritation of upper respiratory tract, cough, headache, nausea, chills, metallic taste in mouth, sweating, and fever. These symptoms of overexposure to metal fume usually disappear in one or two days once the worker is removed from exposure. Chronic effects (unless another toxic metal is involved) have not been documented.

b. Lead(12,13)

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 kidney, peripheral and central nervous systems, and the blood dorming organs. Chronic lead exposure is associated with infertility and with fetal damage in pregnant women.

Blood lead levels below 40 ug/deciliter whole blood are considered to be normal levels which may result from daily environmental exposure. The Occupational Safety and Health Administration (OSHA) standard for lead in air is 50 ug/m^3 calculated as an 8-hour time-weighted average for daily exposure. The standard also dictates that workers with blood lead levels greater than 60 ug/deciliter must be immediately removed from furthe lead exposure and, in some circumstances, workers with lead levels of less than 60 ug/deciliter must also be removed. Removed workers have protection for wage, benefits, and seniority for up to 18 months until blood levels decline to below 50 ug/deciliter and they can return to lead exposure areas.

c. Arsenic(14)

As with lead, inhalation of arsenicals is the most common route of arsenic exposure in the occupational setting. Long-term or chronic arsenical poisoning due to ingestion is rare. However, it can be a consequence of inhaled inorganic arsenic from swallowed sputum and from food or smoking materials contaminated from dust in the air, on surfaces, or on the hands. Chronic industrial arsenic intoxication manifests itself in three different syndromes: (1) complaints of weakness, loss of appetite, occasional nausea and vomiting, sense of heaviness in the stomach with some diarrhea; (2) complaints of conjunctivitis and inflammation of the mucous membranes of the nose, larynx, and respiratory passage. Perforation of the nasal septum is common, and is probably the most typical lesion of the upper respiratory tract in occupational exposure to arsenical dust. Skin lesions are also common; and (3) complaints of symptoms of peripheral neuritis, initially of the hands and feet, which is essentially sensory. In more severe cases motor paralysis occurs.

Numerous epidemiologic studies have shown that chronic exposure to arsenic compounds can cause lung cancer and lymphomas as well as other forms of cancer.

NIOSH has recommended that airborne concentrations of inorganic arsenic be controlled to prevent exposures in excess of 2.0 ug/m^3 as determined by a 15-minute sampling period. This standard was designed to minimize the possibility of developing lymphatic and respiratory cancer. The OSHA standard for inorganic arsenic is 10 ug/m^3 as averaged over an 8-hour work-shift. The ACGIH TLV for arsenic and its soluble compounds is 200 ug/m^3.

d. Beryllium(15)

The main route of exposure of beryllium and beryllium compounds is through the lung. Local contact has produced a granulomatous and scarring skin reaction and can produce a systemic sensitization, aggravating the effects of inhalation.

Under current conditions of exposure, skin reactions are no longer seen in the United States among workers exposed to beryllium. The most serious effect is a granulomatous lung disease, which can produce symptoms of shortness of breath, weight loss, anorexia, and cough. The disease is associated with alterations in immunity and clinical energy. Before the advent of steroids, and when exposures were higher, one-third of all cases died from the chronic form of the disease. In the classical presentation of the disease, there is no remission and steroid dependency is lifelong. There is an acute form of beryllium disease, a chemical pneumonitis, which was common before industrial regulations. There have been no reported cases of the acute disease in the United States in more than 20 years.

Although beryllium disease is generally regarded as an intrathoracic process, liver granulomata to are common and there is at least one case report in the Beryllium Case Registry (BCR) of an exclusively neurological manifestation of the disease.

Beryllium is a potent animal carcinogen. In addition, numerous epidemiological studies (16-18) have demonstrated an increased risk of lung cancer associated with occupational exposure to beryllium. Since no safe level of exposure has yet been demonstrated for a carcinogen, NIOSH recommends that beryllium be controlled as low as possible in the industrial setting so as to materially reduce the risk of cancer.(19)

VI. RESULTS AND DISCUSSION

A. Personal Exposures

Table 2 presents the air sampling data from this evaluation. Only one overexposure was documented. One of three samples collected for silica - 67 ug/m^3, welder - exceeded the recommended exposure limit (50 ug/m^3). Crystobalite exposures were non-detectable (<25 ug/m^3).

Total chromium exposures ranged from below the sampling and analytical limit of detection (air volume adjusted) of 4-7 ug/m^3 to 10 ug/m^3. The recommended exposure limit is 50 ug/m^3. Zinc exposures ranged from 30-130 ug/m^3. The recommended exposure limit is 5000 ug/m^3. Iron exposures ranged from 94-1617 ug/m^3. The recommended exposure limit is 5000 ug/m^3. Nickel and lead exposures were both below the limit of detection (<4 ug/m^3). The recommended exposure limits are 15 and 50 ug/m^3, respectively. Respirable particulate was below the recommended exposure limit of 5000 ug/m^3, ranging from 411-1488 ug/m^3.

B. Area Samples

1. Drywell Area #3

Quartz and crystobalite were both below the limit of detection (<21 ug/m^3), as were chromium (<6 ug/m^3), nickel (<4 ug/m^3), and lead (<4 ug/m^3). Zinc was measured at 16 ug/m^3 and iron at 43 ug/m^3. Respirable particulate level was 255 ug/m^3.

2. Wetwell Area #6

Concentrations of quartz, cristobalite, chromuim, nickel and lead were similar to Drywell Area #3 concentrations. Zinc concentration was 12 ug/m^3 iron was 23 ug/m^3, and respirable particulate was 210 ug/m^3.

C. Conclusion

Figures 1 illustrates the relationship between some metal and silica exposures for welding and grinding operations and the progress toward completion of the construction of the Reactor building. These data have been taken from all three hazard evaluations conducted at Perry Nuclear Power Plant: March 1982, May 1983, and August 1984. The vertical axis is log-scale concentration, in ug/m^3; and the horizontal axis is time. Each column represents exposure to a particular substance, as the key in the figure illustrates. (The March 1982 datum for quartz is from a sandblaster; the May 1983 data do not specify either grinding or welding). The lower edge of the cross-hatched area of a column represents the recommended exposure limit, while the upper edge represents the maximum exposure value recorded for that substance. Hence, the entire darkened area illustrates the extent of overexposure. (Chromium has two different cross-hatches to account for the two types of chromium encountered: chromium metal from grinding and chromium oxide from welding.) The ratios heading each column indicate the number of measurements (not samples, since more than one measurement can be obtained from one sample) which exceeded the recommended exposure limit over the number of measurements made.

Inspection of this figure shows that twenty-nine overexposures, out of a total of seventy-three measurements, were observed in March 1982, while only two were observed in May 1983 and only one in August 1984. In terms of magnitude of exposure the combined percent excess exposure [average of (upper exposure level - recommended exposure limit) x 100%] in March 1982, is 2263%, while in May 1983, it is 340%, and in August 1984, it is 134%.

It appears that as more actual contaminant-producing construction work is completed and more final assembly-type (e.g., wiring) work is phased in, the airborne levels of contaminants are decreasing. This phenomenon may be due to better housekeeping, also. However, since overexposure to silica in the absence of sandblasting operations still can be documented, housekeeping still could be improved.

It seems that the source of silica exposure must be residual from previous sandblasting and is disturbed during work in uncommon places in the Reactor Building. The area samples collected to determine acceptable break areas showed very minor levels of those contaminants that could be detected. These areas, located some distance from welding and grinding operations, were relatively clean and meet the pre-determined definition of a safe break area. However, this definition of clean refers only to the potential for inhalation exposure. The possibility of accumulative contamination from atmospheric settling of dust onto surfaces which may come in contact with food has not been addressed.

VII. RECOMMENDATIONS

Recommendations concerning engineering control, respiratory protection, and housekeeping have been made in previous reports, including a recommendation concerning hazard communication between management and labor. It seems important to reemphasize this concept. It is characteristic of large construction projects to employ many contractors to carry out specialized functions. Each contractor employed, as a condition of employment, should be made responsible for the health and safety of his own employees, and responsible for the actions or processes performed by his employees so that they do not cause hazardous working conditions for other contractors.

If the areas evaluated are going to serve as break areas, then certain requirements are necessary. The areas should be marked or roped off so that tools and other contaminated articles are not brought into the areas. The possibility of debris falling into the break area should be considered. Hand washing facilities should be provided at the break areas. The break areas should be vacuumed daily in order to prevent the accumulation of debris.

Vacuuming and other housekeeping concepts are important in all areas since the data indicate that exposure from residual silica dust is a possibility.

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X. DISTRIBUTION AND AVAILABILITY OF REPORT

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1. United Association of Welders, Pipefitters, and Helpers, Local 120
2. Kaiser Engineers, Perry Nuclear Power Plant
3. NIOSH, Region V
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

Sampling and Analytical Methods
Perry Nuclear Power Plant
Perry, Ohio
HETA 84-437
August 8, 1984

Substance	Sampling Technique	Analytical Technique	Reference
Metals			
iron zinc nickel lead chromium	AA filter, 2.0 Liters/minute flow rate, personal sampling pump	Atomic absorption spectroscopy	P&CAM 173
Silica			
quartz cristabolite	preweighted PVC filter, 1.7 liters/minute flow rate, 10mm nylon cyclone, personal sampling pump	X-ray diffraction	NIOSH Method 7500
Respirable Particulate	preweighted PVC filter, 1.7 liters/minute flow rate, 10mm nylon cyclone, personal sampling pump	gravimetric	No reference-standard pre-and post-weight difference procedure

Table 2

Exposures to Welding Fume and Grinding Particulate
Perry Nuclear Power Plant
Perry, Ohio
HETA 84-437
August 8, 1984

Sample Type, Location and Identification*	Sample Volume (m^3)	Concentration (ug/m^3)							
		Quartz	Cristobalite	Chromium	Zinc	Iron	Nickel	Lead	Respirable Particulate
P-136°, 626' - Grinding	0.632	<24	<24						411
P-120°, 635' - Grinding	0.648	<23	<23						509
P-35°, 642' - Welding	0.598	67	<25						1488
P-135°, 626' - Welding	0.742			<7	82	1617	<4	<4	
P-225°, 630' - Grinding	0.688			<7	30	94	<4	<4	
P-40°, 630' - Weld prep	0.718			10	130	139	4	4	
P-225°, 630' - Welding	0.786			<4					
P-0°, 630' - Weld prep	0.598			<5					
P-60°, 642' - Fabricating pipe	0.692			<4					
A-250°, 647' - Potential Break Area (Drywell #3)	0.707	<21	<21						255
	0.832			<6	16	43	<4	<4	
A-180°, 599' - Potential Break Area (Wetwell Area #6)	0.760	<20	<20						210
	0.894			<6	12	23	<4	<4	
	3.870	<21	<4						
Recommended Exposure Limit		50	50	50	5000	5000	15	50	5000
Limit of detection (air volume adjusted)		<24	<25	<7	<3	<5	<5	<5	<15

*: P = personal, A = area, ° = degrees from north, ' = elevation from sea level

Figure 1

Change in Exposure in the Reactor Building Over Time
Welding and Grinding Operations
Perry Nuclear Plant
Perry, Ohio
HETA 84-437