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PEG PROCESS ENGINEERING GROUP, INC.

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April 19, 1988

Mr. Norman Roberts
Personnel Manager
COPELAND CORPORATION
500 Conrad Harcourt Way
Rushville, IN 46173

Re: **Air Monitoring - Asbestos**
Washer System Cleaning/Entry Procedures

Dear Mr. Roberts:

Following is the report outlining results of two visits Process Engineering Group, Inc. (PEG) made to Copeland Corporation's Rushville plant on March 30 and April 8, 1988. The purpose of these visits were to conduct air monitoring in order to determine employees' potential exposure to airborne asbestos fibers as well as evaluate potential hazards, proper procedures and precautions for the washer system cleaning activities.

BACKGROUND INFORMATION

Copeland Corporation is a manufacturer of refrigeration compressors. Activities at the Rushville plant involve the remanufacture of old refrigeration compressors. Part of the remanufacturing process requires that the old compressor be completely disassembled. Various gaskets (containing asbestos) must be scraped, sanded or buffed off of certain compressor parts. Recently, the Indiana Occupational Safety and Health Administration (IOSHA)

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received an employee complaint concerning potential employee exposure to airborne asbestos fibers when the gaskets are scraped, sanded and buffed. Copeland Corporation has contracted PEG to assist them in determining the potential employee exposures to airborne asbestos fibers. PEG was also requested to review cleaning procedures for the Derust and Finish Washers in order to determine potential employee hazards and recommend safe practices and protective equipment. Following is a discussion of PEG's findings.

I. AIR MONITORING

EMPLOYEE AIR MONITORING PROCEDURE

Five employees working in the tear down area were monitored in order to determine potential exposure to airborne asbestos fibers. Monitoring was conducted utilizing SKC Brand, Model PCXR7 Air sampling pumps in conjunction with 25 millimeter Mixed Cellulose Ester Fiber (MCEF) filters placed in open faced 25 millimeter filter cassette holders. The filter cassettes were equipped with the 50 millimeter extension cowl. Samples were initially collected on March 30, 1988 for a time period ranging from approximately 5¼ to 6 hours. Air sampling pumps were calibrated at 2.0 liters per minute (lpm). The laboratory was not able to analyze these samples due to sample interferences. Therefore, it was necessary to remonitor employees on April 8, 1988. Two to three air samples per five employees monitored were collected for approximately a four hour, twenty minute time period. Air sampling pumps (calibrated at 2.5 lpm) were equipped with similar filter media and cassettes as previously mentioned.

FINDINGS

Bulk samples of the three primary gaskets used on the compressors (Reinz, Oilit, Duroid) were collected and submitted for analysis in order to determine asbestos content of each.

The term asbestos is actually a generic term describing a group of naturally occurring minerals. There are three specific types of asbestos that are commonly found in insulation materials, cements and other miscellaneous materials such as floor tiles, ceiling tiles and gaskets. These types include chrysotile (brown asbestos), amosite (white asbestos) and crocidolite (blue asbestos). There are other types of asbestos, but they are rarely used in commercial products. Laboratory analysis of the gasket materials provided the type of asbestos present in the gasket as well as percent content. Results of the analysis are provided below as well as in Table A.

REINZ (green)	-	85% Chrysotile 5% Cellulose 10% Nonfibrous Material
OILIT (black)	-	80% Chrysotile 10% Cellulose 10% Nonfibrous Material
DUROID (white)	-	20% Chrysotile 70% Cellulose 10% Nonfibrous Material

Cellulose is a fibrous, non-asbestos material that does not have the potential for significant health hazards like asbestos. It is considered an inert or nuisance dust with little, if any, adverse health effects.

Employee monitoring results are documented on the attached tables (see Tables B and C). Results from air monitoring conducted on April 8 showed that all employees monitored were exposed to airborne asbestos fibers at levels above the OSHA 8 hour Time Weighted Average (TWA) Action Level of 0.1 fibers per cubic centimeter (fibers/cc). Two of the five sample results were very near the OSHA 8 hour TWA Permissible Exposure Limit (PEL) of 0.2 fibers/cc. One employee was exposed to asbestos fibers in excess of the PEL. Air-monitoring conducted on April 8 was performed for approximately four hours. It was assumed that the employees' exposure

conditions were similar for the remaining time in the shift as for the first four hours of the shift monitored. These conditions include production rates, room air movements, temperature and barometric pressure. Based upon this assumption, the employees' exposure to airborne asbestos fibers is representative of their exposure levels for an eight hour shift.

The analytical procedure to determine airborne asbestos fiber levels (Phase Contrast Microscopy) does not specifically analyze asbestos fibers. The procedure is an actual count of all fibers meeting certain size characteristics that are present on the filter media. With this procedure, there is no way to distinguish asbestos fibers from other fiberous materials such as cellulose. Bulk sample analysis showed cellulose content of the gaskets in amounts of 5% (Reinz), 10% (Oilit) and 70% (Duroid). Therefore, some of the fibers counted could have been cellulose, rather than asbestos. If only the Reinz and Oilit gaskets were involved, then it is likely that most of the fibers collected on an air sample filter were asbestos. However, in the case of the Duroid gasket (70% Cellulose, 20% Asbestos), most of the airborne fibers could be cellulose rather than asbestos. There is an analytical procedure that can distinguish asbestos fibers from other fibers, however it is an expensive procedure ($270 - $600/sample). This analysis is performed with an electron microscope.

The fact that airborne cellulose fibers, in addition to asbestos fibers, are generated in the process is one consideration when evaluating employee health hazards. However, there are other factors involved that outweigh this consideration and support the fact that employee exposure to asbestos is potentially serious. These factors are as follows:

1. Compressors manufactured as far back as the 1950's are still being remanufactured today. Asbestos content in gaskets manufactured from the 1950's to the 1980's could vary. Therefore, it may be possible

that asbestos content in some gaskets produced in the past is even higher. The concern about asbestos did not arise until the early to mid 1970's, at which time some gasket manufacturers may have taken steps to reduce the asbestos content in their products.

2. There are approximately 10 different types of compressors being remanufactured, each with possibly different types and sizes of gaskets. Production schedules vary from day to day. Therefore, the employees' potential exposure to airborne asbestos fibers will vary from day to day. Weather conditions can also affect the employees' potential exposure. Therefore, on somedays there may be higher airborne asbestos fibers, and lower amounts on other days.

An atmosphere containing airborne asbestos fibers at levels less than or equal to 0.01 fibers/cc is considered to be "clean" by EPA. This level is only enforceable by EPA for asbestos removal activities performed in schools. This level has no bearing on OSHA activities and is mentioned only to provide you with information as to what would be considered an "asbestos free" environment.

DISCUSSION

Since employee exposures to airborne asbestos fibers exceed the OSHA Action Level and Permissible Exposure Limit, specific performance requirements must be followed. A copy of OSHA Standard 29 CFR 1910.1001 Asbestos, Tremolite, Anthophyllite, and Actinolite is enclosed for your review. A summary of the requirements which Copeland Corporation must comply with are outlined below.

1910.1001(d) Exposure Monitoring - Samples representative of the employees' eight hour (full shift) exposure to asbestos must be collected for each employees' job classification in each work area. Air monitoring must take place initially, to determine potential

exposure and at intervals no greater than every six months for employees whose exposures may exceed the 0.1 f/cc action level. Periodic monitoring can be discontinued when it is indicated statistically that employee exposures are below the action level. Additional monitoring is required whenever there is a change in production, process, personnel, control equipment or control practices that may result in new or additional exposures above the action level; or when the company has any reason to suspect that a change may result in new or additional exposures above the action level. Air monitoring methods must be performed in accordance with procedures outlined in the standard.

1910.1001(e) **Regulated Areas** - Regulated areas must be established wherever airborne asbestos fiber concentrations are in excess of the 0.2 fibers/cc PEL. These areas must be demarcated from other work areas in a manner to minimize the number of employees exposed to asbestos. Access to regulated areas must be limited to authorized personnel. Persons entering a regulated area must use a respirator for protection against airborne asbestos fibers. Eating, drinking, smoking, chewing gum or tobacco and applying cosmetics within the regulated area must be prohibited.

1910.1001(f) **Compliance Methods** - Engineering controls and work practices must be implemented, to the extent feasible, to reduce and maintain employee exposures at or below the 0.2 fiber/cc PEL. Wherever these controls and practices are not sufficient to reduce employee exposure to or below the PEL, they must still be used to reduce exposures to the lowest levels achievable. Respirators must then be used to supplement employee protection. Examples of controls or work practices include 1) local exhaust ventilation, 2) tools with direct exhaust ventilation, and 3)

use of wet methods. Rotation of employees cannot be utilized to reduce employee exposures.

When the PEL is exceeded, the company must develop and implement a written compliance program describing methods utilized to reduce employee exposures to airborne asbestos fibers.

1910.1001(g) **Respiratory Protection** - Proper respirators must be selected and used 1) during the interval necessary to implement controls that will reduce exposures below the PEL, 2) during maintenance, repair or other activities for which engineering or work practice controls are not feasible, and 3) in situations where controls are not sufficient to reduce levels below the PEL. A respirator program in accordance with 29 CFR 1910.134 must be established. Part of the program requires that employees be fit tested to ensure proper fitting of the respirator and medical surveillance to ensure employees are physically able to use a respirator.

1910.1001(h) **Protective Clothing** - Employees exposed above the PEL must be provided with appropriate protective clothing (at company's expense). This includes coveralls, gloves, head and foot coverings, and protective eyewear. Contaminated clothing must be removed only in change rooms as described in section (i), below. Contaminated clothing must be placed and stored in closed containers to prevent release of asbestos fibers to the atmosphere.

1910.1001(i) **Hygiene facilities and practices** - Clean change rooms, equipped with showers, must be supplied and arranged in such way to prevent contamination of employee's street clothes from the protective clothing and equipment. Employees must be required

to shower at the end of each work shift. Lunchroom facilities must be provided in such way to insure that the room atmosphere is not contaminated with asbestos. Employees exposed to asbestos must wash their hands and face prior to eating, drinking or smoking. Employees cannot wear contaminated protective work clothing into the lunchroom unless the dust and fibers have been removed by vacuuming or some other method that would not cause the release of airborne fibers.

1910.1001(j) **Communication of Hazards to Employees** - Communication of hazards must be supplied in four different methods. These include 1) warning signs, 2) warning labels, 3) Material Safety Data Sheets (MSDSs), and 4) employee training. Warning signs must be placed at entrances to any regulated area. Warning labels must be affixed to containers of raw materials, scrap waste or debris that contains friable asbestos fibers. Friable means that the asbestos containing material can be crushed, pulverized or reduced to powder by hand pressure. MSDSs must be provided by the manufacturer of the gasket material and made available for employee review. All requirements of 29 CFR 1910.1200 Hazard Communication must be followed. An employee training program must be provided to all employees exposed to asbestos fibers in excess of the 0.1 fiber/cc action level. Training must be done at the time of initial assignment, and annually thereafter. Please refer to 1910.1001(j)(5)(i) for training program content.

1910.1001(k) **Housekeeping** - All working surfaces must be maintained as free as practicable from accumulations of dust and wastes containing asbestos. Any vacuuming must be done with a vacuum cleaner equipped with a high efficiency particulate air (HEPA) filter. Use of compressed air for cleaning purposes must be prohibited. Dry sweeping or shoveling may be used only where HEPA vacuums or wet cleaning methods are not feasible.

1910.1001(l) **Medical Surveillance** - All employees exposed above the action level must be included in a medical surveillance program. Medical examinations must be performed (at no cost to employee) by a physician. The physical must include a medical and occupational history, lung function tests, chest X-ray and completion of a required questionnaire concerning lung disease history. A copy of the physician's written opinion concerning the employee's health must be provided to the employee.

1910.1001(m) **Recordkeeping** - Copies of exposure monitoring records must be maintained for a period of at least 30 years. Medical surveillance records must be maintained for a period of the employee's duration of employment, plus thirty years. Employee training records must be maintained for 1 year beyond the last date of employment of an employee.

1910.1001(o) **Effective Dates** - Employers were given specific dates in which they were to be in compliance with certain parts of the standard. These involved exposure monitoring, establishment of a regulated area, respiratory protection, hygiene and lunchroom facilities, employee training, medical surveillance, and compliance program. However, most of the effective dates of this regulation have passed. The requirement for providing engineering and/or work practice controls must be implemented by July 20, 1988.

Waste Disposal: Regardless of employee exposure levels to asbestos fibers, any asbestos containing materials (ACM) must be disposed of in accordance with the Indiana Department of Environmental Management (IDEM) requirements. Asbestos is classified as a "special waste." It is not subject to hazardous waste regulations, however more extensive procedures other than treating it as regular garbage must be followed.

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Any waste or scrap ACM must be placed in 6 mil thick polyethylene bags. The bag must be properly sealed and labeled. Warning labels specified in the OSHA regulation (1910.1001(j)) must be used. Disposal must be made to IDEM approved sanitary landfills. Contact with the landfill must be made at least 24 hours in advance of shipment. A disposal notification form must accompany each shipment of waste. A list of approved landfills, disposal procedures and a notification form is provided with this report.

RECOMMENDATIONS:

1. Air monitoring should be repeated on days when different size(s) compressors are being remanufactured. This would be useful by providing data that may confirm the initial sampling results and high employee exposures.

2. Efforts should now be made to comply with all of the applicable OSHA Asbestos regulations. Initially, all employees buffing and scraping any gaskets should be informed about their exposures to airborne asbestos fibers and the potential hazards of exposure. Interim protective measures should then be implemented. This includes providing, fitting, and ensuring proper use of respirators (half face with HEPA cartridges), providing protective coveralls as well as use of HEPA vacuums to clean clothing and the work area. Medical surveillance procedures should be implemented as soon as possible. Methods to reduce employee exposures, including use of wet methods and/or local exhaust ventilation should be evaluated and implemented. Management, engineering and supervisory personnel should be involved in this evaluation process. The control methods should also be implemented as soon as possible.

3. Current, as well as all previous manufacturers of the gaskets should be contacted in order to determine asbestos content of each gasket used in the compressors throughout the manufacturing years. This information will

provide more documentation concerning the employees' exposure to asbestos in terms of which type of gasket may be involved. Presently, there is no ban on use of asbestos in these types of products. However, EPA has been proposing a ban on use of asbestos in any material and this ban could be in effect as soon as this summer. Currently, asbestos is banned only in certain materials and products relating to use in building structures (sprayed-on acoustical and fire proofing materials).

II. TANK CLEANING PROCEDURES

Following are the recommended procedures for cleaning of the De-rust and Finish washers. Portions of the washers are cleaned on a weekly basis by maintenance personnel. The washer systems utilize caustic materials (potassium hydroxide and sodium hydroxide solutions).

A. Preparation of washers for cleaning

1. As much liquid as possible (or permissible without risk of allowing sludge in washer to dry) should be drained Friday at the end of the first shift, for the Saturday cleaning. All water heating systems for the washer should be turned off.

2. After liquid has drained, all covers and openings into the washer should be opened. The washer exhaust system should be kept operating overnight and during the cleaning procedure.

3. Place fans (at least two per washer stage) at the washer and tank openings in order to provide fresh air into the washer. Fans should operate overnight and while maintenance personnel are cleaning inside the washer.

B. Personal Protective Equipment

1. Maintenance personnel performing the cleaning task should use the following protective equipment:

a) ...carrying respirator equipped with acid gas ...dust/mist prefilters. The respirator should ... a nose cup to reduce the potential for fogging the inside portion of the lens. A special eyeglass assembly is necessary for personnel that must use prescription glasses with this respirator.

b) Saranex coveralls with attached hood and boots. Seams of the coveralls should be sealed rather than stitched. Stitched seams may leak in some circumstances.

c) Latex or surgical inner gloves with 14" long PVC gloves worn on the outside.

d) Rubber boot covers. These should be worn over the Saranex suit boots in order to provide additional foot protection as well as traction.

The tops of the gloves and boots should be taped (duct tape is suitable) to the coveralls to prevent liquids from entering these openings. When the cleaning task is completed, the exterior portion of the protective clothing must be rinsed with water to remove all sludge material. Protective clothing should be disposed in regular trash. The PVC gloves and boot covers could be reused if there are no holes or tears in the material.

Respirator cartridges should be disposed and the respirator facepiece completely disassembled and cleaned prior to the next use.

Copies from the protective equipment manufacturer's brochures are provided (see attachments) as examples of equipment to be purchased. At the time of the April 8 visit, you had purchased most of these items, with the exception of the respirators, latex gloves and boot covers.

The employee asbestos exposure problem encountered is not thought to be insurmountable or without solution. Rather, by commiting sufficient resources to employee protection activities, Copeland Corporation should be able to reduce the airborne levels of asbestos and reduce the employees health risk.

Thank you for your interest in Process Engineering Group's Industrial Hygiene consulting services. Should you need assistance with employee training regarding asbestos exposures or use of respirators, please contact me. Assistance can also be provided to respond to IOSHA concerning the letter informing the company of the employee complaint. If you have any questions or if you wish to discuss this matter further, please contact me at 1-243-0812.

Sincerely,

PROCESS ENGINEERING GROUP, INC.

Steven R. Ball

Steven R. Ball, CIH
Staff Industrial Hygienist

SRB/ckh

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TABLE A

BULK SAMPLE ANALYSIS FOR ASBESTOS CONTENT

COPELAND CORPORATION
March 30, 1988

1.	Reinz Gasket (Green)	85%	Chrysotile
		10%	Non-fibrous Material
		5%	Cellulose
2.	Oilit Gasket (Black)	80%	Chrysotile
		10%	Non-fibrous Material
		10%	Cellulose
3.	Duroid Gasket (White)	20%	Chrysotile
		70%	Cellulose
		10%	Non-fibrous Material

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TABLE B

EMPLOYEE AIR MONITORING

COPELAND CORPORATION
April 8, 1988

Employee	Job Description	Number	Time Sampled (min)	Result (fibers/cc)	Time Weighted Average Level (fibers/cc)
Betty Barber	Assembler-Scraper/Buffer	APR-10	145	0.111	—
		APR-15	62	0.193	—
		APR-20	62	0.366	—
			267 (total)	—	0.187
Chuck Harpring	Assembler-Scraper/Buffer (Bodies)	APR-11	146	0.111	—
		APR-16	122	0.173	—
			268 (total)	—	0.139
Mindy Robertson	Assembler-Scraper/Buffer (Bodies)	APR-12	143	0.260	—
		APR-17	62	0.343	—
		APR-21	60	0.332	—
			265 (total)	—	0.296
Eugene Thomas	Assembler-Scraper/Buffer	APR-13	144	0.087	—
		APR-18	119	0.174	—
			263 (total)	—	0.126
Marilyn Willoughby	Assembler-Scraper/Buffer (Heads)	APR-14	143	0.122	—
		APR-19	59	0.372	—
		APR-22	59	0.185	—
			261 (total)	—	0.193

OSHA Permissible Exposure Limit (8 Hour Time Weighted Average) = 0.2

OSHA Action Level (8 Hour Time Weighted Average) = 0.1

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TABLE C

EMPLOYER AIR MONITORING

COPELAND CORPORATION
March 30, 1988

Employee	Job Description	Sample Number	Time Sampled (min)	Result (fibers/cc)
Betty Barber	Assembler	MR-10	328	*
Chuck Harpring	Assembler	MR-20	356	*
Phylis Nail	Assembler	MR-30	348	*
Robert Jones	Assembler	MR-40	344	*
Mindy Robertson	Assembler	MR-50	353	*

*Filter samples were not able to be analyzed due to interference of non-fibrous material.