REFERENCE

SHELL OIL COMPANY

DATE RECD: 3/10

PRIVATE & CONFIDENTIAL

TO REFINERY MANAGERS
ANACORTES — CDESSA/CINIZA
HOUSTON — THIS COPY FOR — WILMINGTON
MARTINEZ — WOOD RIVER
NORCO

DATE MARCH 10, 1972

FROM GENERAL MANAGER - REFINERIES - HEAD OFFICE

SUBJECT INDUSTRIAL HYGIENE

PLAINTIFF'S EXHIBIT
SH-987

Handle

On January 4 of this year, the Occupational Safety and Health Administration (OSHA) announced a "Target Health Hazards Program" aimed at improving workplace conditions where potential may exist for exposure of workmen to five toxic substances - asbestos, cotton dust, silica, lead and carbon monoxide. The program will no doubt result in increased attention by Department of Labor Compliance Officers to these substances when they perform facility inspections. Informational sheets (Attachment 1) have already been prepared by OSHA describing these materials, the hazards associated with them, and control of same. Specific instructions (Attachment 2) have been issued to compliance officers regarding sampling of atmospheres to determine if workmen are being exposed to concentrations in excess of that specified in the OSHA Safety and Health Standards.

In view of the foregoing, it is likely that any inspection of a Shell refinery will include a review of potential employee exposure to asbestos, silica and carbon monoxide. We have not included lead since the "Target Health Hazards Program" is concerned only with inorganic lead and exposure of employees to dust or fumes from this material is considered minimal. In addition to asbestos, silica and carbon monoxide, there are certain other substances which also appear to warrant special attention, since they are commonly encountered in our refineries and were among those covered by the safety and health standards issued on May 29, 1971. These standards specify the maximum level at which continuous exposure (eight hours per day) to each of some 480 air contaminants is permissible without using protective equipment.

Examination of the list indicates some 60 of the 480 contaminants could be encountered in a typical refinery (excluding laboratory facilities). Out of these 60, 12 substances have been selected (see Attachment 3) which we believe are most likely to be involved in any inquiry into how effective our safety programs are in protecting employees from excessive exposure. In designating these specific contaminants, consideration was given to factors such as threshold limit values, how extensive a material is either used in the refinery or in a process, potential for release to the atmosphere, and whether the substance possesses characteristics where its presence in the air would be readily detected at levels below the threshold limit value.

Although in our opinion the exposure levels to refinery employees from airborne contaminants are either well on the safe side or else adequate precautions are being followed involving use of protective equipment, we believe it would be prudent to initiate a program to provide for monitoring

the atmosphere periodically at locations where the substances listed on the attachment may occur. With the exception of asbestos and silica, sampling for the other materials can be accomplished with conventional detector tubes or other techniques commonly utilized by refinery safety staffs. The analysis for asbestos and silica is somewhat more complicated and we plan to solicit the assistance of industrial hygienists from the Head Office Occupational Safety and Health Department in evaluating exposure of employees to these substances. Initially, such a study will probably be limited to a single location to gain general insight into the severity of exposure. With regard to the other ten substances, we are thinking in terms of all refineries performing measurements quarterly until meaningful trends are established.

This initial effort to document existing levels of hazardous substances and thereby demonstrate that typical refinery exposures are below the allowable TLV's is in anticipation of what we believe will be an accelerating program of monitoring by the Department of Labor. Eventually, industrial hygiene programs may have to be expanded somewhat since the Department of Labor has plans for developing detailed standards for many of the toxic substances and harmful physical agents. Presumably, these will be similar to the one presently proposed for asbestos, which was forwarded to refineries by Manufacturing Engineering with their memorandum of February 1, 1972. It is expected that in some cases the standards will require development of considerable detailed information on exposure of employees to health hazards.

As an adjunct to the proposed program of monitoring outlined above, we have made plans for industrial hygienists from Head Office to survey Wood River Refinery in the near future to determine if some additional action would be warranted at this time in regard to our industrial hygiene programs. While awaiting the outcome of that survey, we would appreciate your reviewing the attached list and transmitting to this office any comments you have pertaining to sampling for contaminants, plus any additional views which you believe should be considered in regard to further action in the area of industrial hygiene.

G. Holzman

Attachment

cc: General Manager - Technical Departments
Assistant to the General Manager - Refineries
Occupational Safety and Health - Manager
Manufacturing Engineering - Manager

TARGET HEALTH HAZARD FACT SHEETS
PREPARED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

ASBESTOS

What is it? Asbestos is a general term used to describe several fibrous mineral silicates that occur as white, grayish or greenish masses, either compact or of long silky fibers. The most important types are: Chrysolite – a simple magnesium silicate; amosite – a complex magnesium iron silicate, crocidolite – a complex sodium iron silicate. Some 95 per cent of world asbestos production comes from chrysolite.

Where is it? The heat-resistant properties of asbestos have led to many uses – for example, as protection against fire, as insulation, brake and clutch linings, building materials, as a filter and in plastics. The raw material and end-products are found nearly everywhere.

What is the hazard? More than 200,000 employees face risks from asbestos. The principal danger is caused by inhaling asbestos fibers. Recent studies have shown the presence of asbestos fibers in the lungs of persons having no industrial exposure – probably due to their presence in the atmosphere near construction sites. Prolonged inhalation of asbestos fibers between 5 and 50 microns (one-millionth of a meter) long can produce a lung disease known as asbestosis. The lungs cannot eliminate asbestos fibers, so the fibers coat the tissues. If this process continues over a period of 10 to 20 years, with significant quantities of asbestos present, the tissue reaction progresses until a generalized, diffuse fibrosis occurs, causing severe respiratory disability. There have been reports of increased incidence of lung cancer in persons with asbestosis.

How it is controlled? Enclosure and local exhaust ventilation applied to equipment and/or operations are the principal means of preventing employee exposure to dangerously high concentrations. U.S. Bureau of Mines-approved dust respirators may be worn by employees as protection for some operations.

What are approved levels? OSHA's permissible level is 5 fibers per milliliter greater than 5 microns in length for an eight-hour, time-weighted, average airborne concentration. This may be increased to 10 such fibers per milliliter for no more than 15 minutes per hour, up to five hours per eight-hour day. Imminent danger situations are generally not applicable. Any exposure greater than permissible levels for unprotected or improperly protected workers is considered a serious violation.

How is it measured? Asbestos dust will be collected with a personal sampling pump. Fibers will be counted microscopically at 400-450 magnification using phase contrast illumination.

COTTON DUST

Where is it? Cotton dust occurs throughout the textile industry and affects cotton, flax and soft hemp workers. The greatest exposure to cotton dust generally occurs during the carding of cotton – an operation that combs out cotton fibers and sets them parallel by drawing them between toothed cylinders. However, machinery throughout the cotton mill must be cleaned frequently, and much exposure to cotton dust occurs then.

What is the hazard? More than 800,000 employees in cotton processing operations of all types are exposed to cotton dust. While the exact effects of cotton dust are not known, prolonged exposure to heavy air concentrations can cause a disabling lung disease known as byssinosis. Materials adhering to cotton fibers, such as unwanted leaf, stem and boll trash, when inhaled, elicit an allergic reaction or response. Byssinosis generally advances through three recognizable stages. The first is commonly called "Monday fever" and begins only after exposure of more than 10 years. Workers develop an irritating cough, tightness of the chest and breathlessness. The attacks usually come on Monday, or after a period of absence from the plant and last only a day or so; hence the name "Monday fever." In the second stage, these symptoms extend over more days in the week and finally become permanent. If exposure to cotton dust is ended at this stage, recovery can occur. In the third stage, the tightness of the chest and labored breathing become so distressing the worker must leave the industry. The disease can progress then to chronic bronchitis and emphysema.

How is it controlled? Enclosure of machinery in all operations and local exhaust ventilation are the principal means of preventing employee exposure. Pretreatment of the cotton in early processing stages may also be helpful.

What are approved levels? OSH's permissible level is 1 milligram per cubic meter of air for an eight-hour, time-weighted, average airborne concentration. Imminent danger situations are generally not applicable. Concentrations of 3 milligrams per cubic meter, are considered serious violations; concentrations between 1 and 3 milligrams per cubic meter for an eight-hour, time-weighted, average, are considered regular or nonserious violations.

How is it measured? A personal sampler is attached to a workman's clothing with the uncovered filter facing down, usually for a six-hour sample.

SILICA

What is it? Silica is an oxide of silicon and is the characteristic ingredient of a great variety of minerals, including quartz, cristobalite, tridymite, amethyst and sand. It is widely used in cores for metal casting operations, ceramics, decorative materials, insulation, building materials and glass.

Where is it? Silica is found throughout industry in various manufacturing processes, such as iron and mineral processing plants, mining, abrasive soap production, glass manufacturing, potteries, foundries, abrasives use and manufacturing, in stone cutting and finishing industries.

What is the hazard? More than 1.1 million employees are exposed to the hazard created by inhalation of silica dust. Inhalation of these particles can produce rapidly-developing (acute) or chronic silicosis – a disabling lung disease. Typically, the lung tissue reacts to the presence of silica particles by forming fibrous matter around the particle. Evidence suggests that particles below one micron (one-millionth of a meter) in size may be the most dangerous since they may penetrate deeper into the lungs in high concentrations. In rapidly-developing silicosis, symptoms appear eight to 18 months after the first exposure. Chronic silicosis, the type usually encountered in industry, generally, is produced only after years of silica inhalation. The symptoms for either type are the same – slowly increasing difficulty in breathing under exertion. In some workers, large masses of dense fibrous tissue develop in the upper portion of the lungs, leading to severe respiratory crippling. Tuberculosis is a frequent complication of silicosis.

How is it controlled? The best method is substitution of another material; for example, use of steel shot or alumina grit in place of sand-blasting operations. Other methods include enclosure of operations, local exhaust ventilation, segregation of operations, wetting, and ordinary good-housekeeping practices.

What are approved levels? For respirable quartz particles, OSHA's permissible level is 10 milligrams per cubic meter of air, divided by the per cent of free silica plus 2, as shown in this formula: $\frac{10 mg/m^3}{\%SiO_2 + 2}$.

For respirable cristobalite and tridymite, the limits are one-half the value for quartz. Imminent danger situations generally are not applicable. Any eight-hour, time-weighted average greater than four times the limit is considered a serious violation. Exposure to concentrations between the limit and four times the limit are considered a regular or nonserious violation.

How is it measured? Personal sampling pumps with filters are used to collect dust samples for worker exposure. The collected dust then is weighed for a given volume of air. Similar procedures are used to determine the percentage of silica in the air.

LEAD

What is it? Lead is a soft, dense, malleable, heavy metal with a low melting point. It is gray in color and, because of its characteristics, has a wide application of uses.

Where is it? Lead is used to make printing type and plumbing, shield telephone and power cables and to protect against radiation hazards. As an alloy, lead mixed with steel makes excellent bearings. As solder, lead alloy is vital in the electrical and electronic industries. Lead compounds are used to make paints and ammunition, and lead oxides are used in car batteries.

What is the hazard? More than 1.6 million employees in nearly every industrial manufacturing process and in many service industries are exposed to the poisoning effect of lead. Lead can enter the body by inhalation, absorption through the skin or by ingestion. In sufficient quantities, the result is the same – severe gastrointestinal, blood and central nervous system disorders. Inhalation of lead dust or fumes is the most frequent means of entry and results in most of the industrial health problems involving this metal. Lead is a cumulative poison. A part of a small daily dose is not eliminated, but is stored in the body. Eventually, a point is reached where symptoms and disability – even death – occur.

How is it controlled? Since the primary route of industrial lead poisoning is inhalation, enclosure and local exhaust ventilation are the principal means of control. Daily wet or vacuum cleaning of all lead dust, personal hygiene, prohibition of food and beverages in the work area and use of U.S. Bureau of Mines-approved respirators are other means that can help control exposure.

What are approved levels? OSHA's permissible level is 0.2 milligrams per cubic meter of air for an eight-hour, time-weighted, average airborne concentration. Imminent danger situations are not generally applicable. Any exposure above 0.6 milligrams per cubic meter of air for an eight-hour, time-weighted average is considered a serious violation. Levels above 0.2 and less than 0.6 are considered regular or nonserious violations.

How is it measured? The atmosphere is sampled with personal sampling pumps and filters for a minimum of 60 minutes. Filters then are weighed to determine concentrations.

CARBON MONOXIDE

What is it? Carbon monoxide is a colorless, almost odorless, tasteless, nonirritating gas. It is produced by the incomplete combustion of fuels, such as wood, gas, coal oil and gasoline. Miners refer to it as "white damp". It also is commonly called "coal gas".

What is it? Carbon monoxide is found anywhere carbonaceous fuels are used. It can be found in everyday activities as well as in industrial situations – near incorrectly vented gas heaters, near gasoline-powered machinery and around automobiles run indoors; blast furnaces; and catalytic reduction operations.

What is the hazard? Because it is found so widely, nearly everyone, at one time or another, is exposed to carbon monoxide. The danger lies in inhalation of gas. Carbon monoxide enters the blood stream through the lungs in the same manner as oxygen, but it displaces oxygen in the blood because it has approximately 210 times greater affinity for hemoglobin in the blood than oxygen. As a result, the blood cannot transport oxygen, causing suffocation even in an atmosphere containing ample oxygen. Over a period of time, as little as 700 parts per million of carbon monoxide will saturate 50 percent of the blood hemoglobin – while a few breaths at concentrations of 10,000 parts per million may cause 60 to 80 percent saturation and death. Fortunately, regardless of how high the percentage of saturation of the blood has been, practically all carbon monoxide is eliminated by the body within 8 to 10 hours after exposure ends.

How is it controlled? In general, adequate ventilation will prevent carbon monoxide poisoning. Enclosure, general or dilution ventilation and local exhaust ventilation.

[illegible] isolation of hazardous operations are the principal means of preventing employee exposure to dangerous concentrations. Automated detection alarm systems also are useful control measures.

What are approved levels? OSHA's permissible level is 50 parts per million parts of air for an eight-hour, time-weighted, average airborne concentration. Concentration above 500 parts per million for any length of time are considered to be imminent danger situations. Concentrations above 150 parts per million for a total of one hour or more are considered to be serious violations. Concentrations above 50 parts per million, but below 150 parts per million for an eight-hour, time-weighted average are considered regular or nonserious violations.

How is it measured? The primary method is a carbon monoxide portable, Hopcalite-reagent type meter. The secondary method is certified detector tubes.

SAMPLING DATA SHEETS FOR HEALTH HAZARDS PREPARED BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

OSHA SAMPLING DATA SHEET NO. 1

Substance:

Carbon monoxide.

Standard: 29 CFR 1910.93(b) Table G-1, of August 13, 1971

8-hour time-weighted average: 50 ppm (55 mg/m^3).

Sampling Equipment:

(1) CO meter. (Portable, Hopcalite – reagent type) – Follow directions. (Primary Method)

(2) Certified or NIOSH approved detector tubes and a hand operated pump (not squeeze bulb) may be used for compliance purposes. (Secondary Method)

Analytical Procedure:

(1) Direct reading instrument based on measurement of heat of reaction produced by oxidation of CO to CO_2. Follow instructions.

(2) Detector tubes are read for length of stain, strokes of pump are noted and appropriate corrections made for pressure (or altitude) above 5000 feet (1500 m). The tubes are not to be used when below 0 degree F (-18 C) or above 125 degrees F (52 C).

Sampling Period:

(1) Hopcalite: maximum feasible number of readings should be averaged to determine average exposure. Time required dependent on variability and cyclical nature of exposures.

(2) Detector tubes: direct reading, length-of-stain detector tubes (certified on NIOSH approved) may be used for compliance purposes, if at least one sample per hour is taken per exposed worker or close group of workers. In an 8-hour day more frequent samplings per hour are preferred, especially for exposures over 50 ppm. Eight different samplings (one per hour is considered the minimum acceptable number).

Imminent Danger Situations:

Concentrations above 500 ppm (10 x TLV) for any length of time are considered to be an imminent danger.

Serious Violation:

Concentrations above 150 ppm (3 x TLV) for a total of 1 hour or more in an 8-hour workday are considered serious.

Nonserious Violation:

Concentrations above 50 ppm, but below 150 ppm for an 8-hour time-weighted average are considered nonserious violations.

De Minimis Violation:

Not applicable.

OSHA SAMPLING DATA SHEET NO. 2

Substance:

Asbestos.

Standard: 29 CFR 1910.93a(a) of December 7, 1971

8-hour time-weighted average*: 5 fibers per milliliter greater than 5 microns in length.

Excursion limit*: 10 fibers per milliliter, up to 15 minutes in an hour for up to 5 hours per 8-hour day.

*Unprotected or improperly protected worker exposures.

Analytical Method:

Fibers counted at 400-450 magnification, using phase contrast illumination, with sample mounted in high-viscosity solution of membrane filter material.

Sampling Equipment:

Personal sampling pump plus Millipore type AA filter (37 mm, 0.8 micron pore size). Face cap is removed and filter used open face during sampling. Sampling rate: 2 l/m.

Sample Size:

Minimum period of 15 minutes for evaluation of excursion limit. Several samples of up to 4 hours for evaluation of 8-hour average. Samples with a visible deposit may be too heavy to count. Compare with a clean filter. Heavy concentrations of visible dust in the air (100 to 500 fibers/ml) may require short sampling periods of only 5 minutes, or less.

Blanks:

With each batch of samples submit two filters which are subjected to exactly the same handling as for the samples except that no air is drawn through them. Label these as blanks.

Shipping:

The cassettes in which the samples are collected should be shipped in a suitable container, designed to prevent damage in transit.

Imminent Danger Situations:

Generally not applicable.

Serious Violation:

5.1 or more fibers per ml, greater than 5 microns in length, for an unprotected or improperly protected worker, for an 8-hour time-weighted average, except for certain proven excursions as noted in the emergency standard, which may raise the 8-hour time-weighted average to 5.8 fibers per ml.

Nonserious Violation:

Not applicable.

De Minimis Violation:

Not applicable.

OSHA SAMPLING DATA SHEET NO. 3

Substance:

Crystalline silica.

Standard: 29 CFR 1910.93(b) Table G-3 of December 7, 1971

Form — $\frac{10\ mg/m^3}{\%SiO_2 + 2}$

Quartz (respirable):

Cristobalite: One-half the value for quartz

Tridymite: One-half the value for quartz

Analytical Method:

Gravimetric personal samples for worker exposure should be tared and reweighed by DOL on a Cahn balance. The percent of free silica is determined by NIOSH on the fixed location sample using a colorimetric wet chemical method, minimum detectable amount: 0.01 mg/filter.

Sampling Equipment:

For worker exposure: Personal sampling pump plus preweighed MSA type FWS-B or Gelman type VM-1 filter, using 2-piece filter cassette and 10 mm nylon cyclone. Two filters should be subjected to the same handling as the samples except that no air is drawn through them, and these should be used as blanks. Sampling rate: 1.8 l/m.

For determining % quartz: Collect at fixed locations near workers, using NIOSH preweighed MSA type FWS-B filters in 3-piece cassettes plus Gast 1531 pump with 9 l/m critical orifice and 1/2 inch steel cyclone. The vacuum release valve should be adjusted to 10-15 in. Hg suction. Two blanks of the same filter type should be submitted with the sample. Sampling rate: 9 l/m.

Sample Size:

Minimum: 4 hours. Maximum: 8 hours.

Shipping:

The cassettes in which the samples for determining % quartz are collected should be shipped to NIOSH in a suitable container, designed to prevent damage in transit.

Imminent Danger Situations:

Generally not applicable.

Serious Violation:

Any 8-hour time-weighted average greater than 4 x stated TLV value.

Nonserious Violation:

Any 8-hour time-weighted average between the stated TLV and 4 x that value.

De Minimis Violation:

Not applicable.

OSHA SAMPLING DATA SHEET NO. 4

Substance:

Lead and its inorganic compounds (except lead arsenate).

Standard: 29 CFR 1910.93(b), Table G-2 of August 13, 1971 & ANSI Z37.11-1969

8-hour time-weighted average: 0.2 mg/m^3

Analytical Method:

Atomic absorption.

Detection Limit: 0.0003 mg/filter.

Sampling Equipment:

Personal sampling pump plus unweighted 37 mm Millipore type HA filter. Either 2- or 3-piece filter cassette may be used [illegible]mpling rate: 1.5 l/m.

Sample Size:

A minimum sampling period of 60 minutes is recommended, and longer periods, up to full shift, are preferable. Care must be taken to prevent material from falling off heavily loaded filters during shipment. This may be done by placing another filter on top of the one with the sample, exercising care not to dislodge any of the sample in the process.

Blanks:

With each batch of samples, submit two filters which are subjected to exactly the same handling as for the samples except that no air is drawn through them. Label these as blanks.

Shipping:

The cassettes in which the samples are collected should be shipped in a suitable container, designed to prevent damage in transit.

Imminent Danger Situations:

Generally not applicable.

Serious Violation:

Anything above 0.6 mg/m$_3$ for an 8-hour time-weighted average.

Nonserious Violation:

Anything above 0.2 mg/m^3 and less than 0.6 mg/m^3 for an 8-hour time-weighted average.

De Minimis Violation:

Not applicable.

OSHA SAMPLING DATA SHEET NO. 5

Substance:

Cotton dust (raw).

Standard: 29 CFR 1910.93(b), Table G-1 of August 13, 1971

8-hour time-weighted average: 1 mg/m^3

Analytical Method:

Net weight of gross airborne dust, using balance with sensitivity of 0.01 mg.

Sampling Equipment – Personal Samplers:

Cotton is to be determined primarily with the personal sampler attached to the workman's clothing with the face of the filter pointing down. The filter should not be covered. Our experience is that at least a 4- and preferably a 6-hour sample (at 1.5 l/m) is required in a textile plant opening or carding area to obtain reliable results. A preweighed filter (0.01 mg) should be used and reweighed to the same accuracy.

There is no ceiling or any limit on excursions.

Because of the nature of both the sampling method and the development of byssinosis, it is neither desirable nor possible to get grab samples.

Sampling Equipment – General Work Area:

Preweighed Gelman VM-1 or MSA type FWS-B 5 micron pore size filter in 3-piece cassette, located in the general work area with the cap removed and the filter facing down. Suction provided by Gast 1531 pump with a 7.4 l/m critical orifice. The vacuum relief valve should be

adjusted to maintain 10-15 in. Hg suction. Sampling rate: 7.4 l/m for recommended minimum of 60 minutes. Longer period samples up to full shift are preferable. Filters should not be so heavily loaded that the sample is dislodged in transit.

Blanks:

With each batch of samples collected, two additional filters should be subjected to exactly the same handling except that no air is drawn through them. These should be used as blanks.

Shipping:

The cassettes in which samples are collected should be shipped in a suitable container, designed to prevent damage in transit.

Imminent Danger Situations:

Generally not applicable.

Serious Hazard:

An 8-hour time-weighted average above 3 mg/m^3 for identified worker. 3 x TLV.

Nonserious Hazard:

An 8-hour time-weighted average above 1 mg/m^3 and below 3 mg/m^3 for an identified worker.

De Minimis Violation:

Not applicable.

AIR CONTAMINANTS PROPOSED FOR INCLUSION IN MONITORING PROGRAM

Substance	Threshold Limit Value ppm[a]	Threshold Limit Value mg/M3[b]
Asbestos	[c]	
Benzene	25	80
Carbon Monoxide	50	55
Hydrogen Fluoride	3	2
Hydrogen Sulfide	10	25
Mercury	-	0.1[d]
Methyl Ethyl Ketone	200	590
Phenol	5	19
Silica		[e]
Sulfur Dioxide	5	13
Toluene	200[f]	750[f]
Xylene	100	435

a) Parts of vapor or gas per million of contaminated air by volume at 25°C and 760 mm. Hg. pressure.

b) Milligrams of particulate per cubic meter of air.

c) Covered by a special emergency standard issued December 7, 1971, which bases threshold limit on maximum of five fibers per milliliter greater than five microns in length, rather than on ppm. A proposed permanent standard recommends same TLV level.

d) Change to 0.05 mg/M3 is proposed.

e) Quartz = $\frac{10 \text{ mg/M}^3}{\%S_1O_2+2}$

Cristobalite or tridymite: One-half value for quartz.

f) Change to 100 ppm and 375 mg/M3 is proposed.