

SHELL OIL CC ANY

J. L. RANARD 724
SH-116
RES RES
SHELL CHEMICAL COMPANY

DEER PARK MANUFACTURING COMPLEX

DATE DECEMBER 1, 1975

PLAINTIFF'S EXHIBIT

TO D. O. CHRISMER

FROM J. D. RANDELL

SH-1666

SUBJECT RESPIRABLE DUST MONITORING
DURING SANDBLASTING

Air sampling was conducted October 6 and 8 to measure sandblaster's exposure to respirable dust. The purpose of these measurements was to check the effectiveness of the Cesco supplied-air respirators. The results showed that the Cesco air-supplied hood significantly reduces exposure. Although the Cesco hood provides more protection than the previously used hood, eight-hour time-weighted average exposures are very near and could at times exceed the permissible limit.

SCOPE

The survey was limited to the measurement of respirable dust concentrations inside the Cesco hood as sandblasters worked in the sandblast yard.

DESCRIPTION OF OPERATION

Sandblasting is done in an open yard located on the north edge of the Refinery adjacent to the Houston Ship Channel. A storage building is located near the middle of the yard and is also used as shelter for lunch and breaks. The west side of the yard is used for blasting larger pieces of equipment while smaller pieces are blasted on the east side.

A course sand, Clemtex No. 3, and a fine sand, Clemtex No. 5, are used for blasting. However, inspection of the sand on the survey days showed that the No. 3 sand was finer than usual, probably because an incorrect grade of sand had been delivered.

The sandblaster usually moves in and around the pieces of equipment being blasted so he is unable to always be upwind of the blasting. Sandblasting is sporadic throughout the day, but typically less than four hours per day per man.

HEALTH STANDARD

The OSHA eight-hour time-weighted average (TWA) exposure limit for respirable dust containing free silica is determined by the following formula:

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

DPMC-00749

LAM 007241

Since the limit is a function of the free silica content, the limit will vary from 0.1 mg/m^3 for 100% free silica dust to 5 mg/m^3 for dusts without free silica. The limit was set in order to prevent a pulmonary fibrotic condition called silicosis from chronic exposure.

SAMPLING/ANALYTICAL PROCEDURES

Breathing zone samples for respirable dust were collected by attaching at the worker's waist a sampling pump (either a MSA Model G or a Bendix C-115 or Bendix Unico Micronair) connected by plastic tubing to a MSA, Type FWS-B, 5.0 micron pore size, 37 mm PVC filter which was preceded by a 10 mm nylon cyclone. The filter-cyclone assembly was pinned to the shirt collar, underneath the sandblasting hood. The air was sampled at 1.8 liters per minute.

Pumps were calibrated in the morning before sampling and the flow rate rechecked that afternoon after sampling.

The weight of the dust on the filters and the percent silica content of the dust were determined at the Bellair Research Center. Percent silica determinations were done by x-ray diffraction using NIOSH method P & CAM No. 109.

FINDINGS

Free silica analysis was attempted and the results are reported in Table 2. Because the dust loading on the filters was so low, the free silica determinations have a large analytical error. As a result, the data are best interpreted by comparing them with the results of a similar survey done in September 1974. The main difference between the surveys was the protective hood being tested.

Table 1 shows that exposure to total respirable dust was less than in September 1974. While actually sandblasting, the average exposure was 0.42 mg/m^3 compared to an average of 2.34 mg/m^3 in 1974. The nearly six-fold reduction is primarily due to the better protection afforded by the Cesco air-supplied hoods. Ordinarily, the worker sandblasts much less than eight hours so his 8-hour TWA would be less than 0.42 mg/m^3 . Only one measurement was made for the 8-hour exposure, with the result being 0.094 mg/m^3 when blasting 31% of the workday. The average of six long-term measurements in 1974 is between 3 and 4 times this measurement and workers averaged sandblasting only 12% of the time. Although, one measurement for 8-hour exposure is hardly adequate for precise determinations of such variable exposure, it does reinforce the conclusion that substantial reduction in exposure has been achieved.

TABLE 1. COMPARISON OF THE OCTOBER 1975 SURVEY RESULTS WITH THE SEPTEMBER 1974 SURVEY RESULTS

Survey Date	SAMPLES MEASURING EXPOSURE WHILE SANDBLASTING		SAMPLES MEASURING 8-HOUR AVERAGE EXPOSURE	
	9/4-19/74	10/6-8/75	9/4-19/74	10/6-8/75
Protective Hood	Mc Donald	Cesco ⁽¹⁾	Mc Donald	Cesco ⁽¹⁾
No. of Samples	4	4	6	1
Fraction of Survey Time Spent Sand- blasting (%)	Approximately 100	Approximately 100	Average of 12	31
Range of Results ⁽²⁾ (mg/m ³)	1.95 - 2.62	0.18 - 0.78	0.196 - 0.438	-
Average of ⁽²⁾ Results (mg/m ³)	2.34	0.42	0.31	0.094
Range of Free Silica Content (%)	27.6 - 100	(4)	28.6 - 89.4	(4)
Average Free Silica Content (%)	78	(4)	56	(4)
Range of OSHA ⁽³⁾ Limit (mg/m ³)	0.10 - 0.27	(5)	0.11 - 0.35	(5)
Average OSHA ⁽³⁾ Limit (mg/m ³)	0.15	(5)	0.22	(5)

(1) NIOSH tested and certified.

(2) Results are expressed as milligrams of total respirable dust per cubic meter of air

(3) Eight-hour time-weighted average exposure limit in milligrams of total respirable dust per cubic meter of air

(4) Insufficient dust was collected on filters to permit accurate determination of free silica.

(5) Exposure limit could not be calculated since free silica content was uncertain.

Since equipment and sand type did not change between surveys, the free silica content of the respirable dust samples would not be expected to differ significantly between surveys. Therefore, the OSHA limits calculated as applicable to the 1974 findings would approximate the limits for the 1975 measurements. In 1974 the OSHA 8-hour TWA limit ranged from 0.11 to 0.35 mg/m³ for the long-term samples and averaged 0.22 mg/m³. The only long-term measurement in October 1975 was 0.094 mg/m³ which would be below the limit for 100% free silica dust (limit of 0.1 mg/m³).

The table below shows the predicted 8-hour TWA on the basis of 0.42 mg/m³ exposure while sandblasting and zero exposure when not sandblasting.

<u>Time Actually Sandblasting</u>	<u>Percent of Workday Spent Sandblasting</u>	<u>8-hour TWA</u>
1 hour	12.5	0.05 mg/m ³
2 hours	25	0.11 mg/m ³
3 hours	37.5	0.16 mg/m ³
4 hours	50	0.21 mg/m ³
5 hours	62.5	0.26 mg/m ³
8 hours	100	0.42 mg/m ³

The estimates of full day exposure on this basis is crude, but it does indicate that exposure to the sandblaster is below the limit when sandblasting for less than two hours during the day. Sandblasting for two to four hours causes exposures very near the exposure limit and sandblasting for more than four hours of the workday could result in overexposure.

CONCLUSIONS

The NIOSH certified Cesco air-supplied hood is a significant improvement over the hood used during the September 1974 survey. The use of the Cesco hood resulted in approximately a six-fold reduction in exposure. However, the eight-hour time-weighted average exposures are still very near and could at times exceed the permissible exposure limit.

RECOMMENDATIONS

The following items recommended in order to insure that employee exposure is less than the OSHA limit.

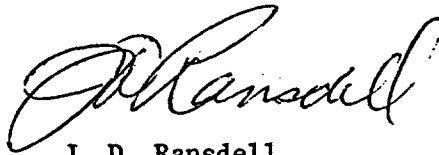
1. Increase the effectiveness of the respiratory protection program by:
 - a. requiring the sandblasters to use the Cesco supplied-air hoods, even though these hoods are bulkier and heavier than previous ones.
 - b. instituting a regular inspection and maintenance of equipment by the foreman or a designated individual.
 - c. cleaning and storing equipment in a relatively dust-free area.

DPMC-00752

LAM 007244

? / A copy of OSHA Standard CRF 1910./34 Respiratory Protection is attached.

2. A finer sand than No. 3 was being used because of a delivery mixup. Since the finer sand can result in a higher fraction of respirable dust, stricter control in the selection and receipt of sand would reduce this occurrence.
3. Regular monthly monitoring for the next four months is advisable for sandblasters in the yard. Initial measurements should be made during sandblasting in vessels to determine the effectiveness of the protective hoods.
4. The feasibility of installing a turntable for blasting small pieces of equipment should be evaluated from an operational point of view. A turntable will allow the operator to stay upwind of his work and thereby minimize his exposure.
5. Both Martinez and the Norco plant have recently tried substitutes for sand. Martinez is trying a 35 mesh "kleen Blast" material and Norco is trying a material called "Stan-Blast". Both products are low in free silica and I will contact each location for more information.



J. D. Ransdell

JDR:gew

cc - R. L. Bryan
W. H. Probst
F. G. Reitz
J. L. Rivard

DPMC-00753

LAM 007245

TABLE 2. OCTOBER 1975 RESPIRABLE DUST MONITORING RESULTS AT REFINERY SANDBLAST YARD

SAMPLE NUMBER	SAMPLE DATE	EMPLOYEE	SAMPLE TIME	SAMPLE RESULTS				WORK DESCRIPTION
				DUST LOADING ON FILTER (mg)	TOTAL RESPIRABLE DUST (mg/m ³)	FREE SILICA IN TOTAL RESPIRABLE DUST (1)	RESPIRABLE FREE SILICA (mg/m ³) (1)	
1329-12-2	10-6-75	M. H. Alston	6 hrs. 46 min.	.07	0.09	24 (1)	0.023 (1)	Sandblasted for approximately 2.5 hours over the course of the day; remained in the sandblast yard during the workday.
1329-12-4	10-6-75		15 min.	.02	0.78	3.3 (1)	0.026 (1)	Sandblasted during 13 minutes of the 15 minute sample.
1329-12-5	10-6-75	Lunch Table In Sandblast Yard Warehouse	1 hr. 24 min.	.03	0.17	1.8 (1)	0.0027 (1)	Sampler was operated during breaks and periods when there was no sand-blasting.
1329-12-6	10-8-75		57 min.	.02	0.18	3.9 (1)	0.007 (1)	Sandblasted for 47 minutes.
1329-12-7	10-8-75		91 min.	0.77	0.48	35 (1)	0.138 (1)	Sandblasted for 79 minutes.
1329-12-9	10-8-75		116 min.		0.24	34 (1)	0.081 (1)	Sandblasted the entire time
1329-12-10	10-8-75	Sample Blank	-	-	-	-	.0009 mg (1)	

(1) The analysis was performed near the analytical method's limit of sensitivity. The resulting analytical error is so large that these determinations are of doubtful accuracy and should not be considered valid.

Educational Eye and Face Protection, Z87.1-1968.

§ 1910.134 Respiratory protection.

(a) *Permissible practice.* (1) In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used pursuant to the following requirements.

(2) Respirators shall be provided by the employer when such equipment is necessary to protect the health of the employee. The employer shall provide the respirators which are applicable and suitable for the purpose intended. The employer shall be responsible for the establishment and maintenance of a respiratory protective program which shall include the requirements outlined in paragraph (b) of this section.

(3) The employee shall use the provided respiratory protection in accordance with instructions and training received.

(b) *Requirements for a minimal acceptable program.* (1) Written standard operating procedures governing the selection and use of respirators shall be established.

(2) Respirators shall be selected on the basis of hazards to which the worker is exposed.

(3) The user shall be instructed and trained in the proper use of respirators and their limitations.

(4) Where practicable, the respirators should be assigned to individual workers for their exclusive use.

(5) Respirators shall be regularly cleaned and disinfected. Those issued for the exclusive use of one worker should be cleaned after each day's use, or more often if necessary. Those used by more than one worker shall be thoroughly cleaned and disinfected after each use.

(6) Respirators shall be stored in a convenient, clean, and sanitary location.

(7) Respirators used routinely shall be inspected during cleaning. Worn or deteriorated parts shall be replaced. Respirators for emergency use such as self-contained devices shall be thoroughly inspected at least once a month and after each use.

(8) Appropriate surveillance of work area conditions and degree of employee exposure or stress shall be maintained.

(9) There shall be regular inspection and evaluation to determine the continued effectiveness of the program.

(10) Persons should not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. The local physician shall determine what health and physical conditions are pertinent. The respirator

user's medical status should be reviewed periodically (for instance, annually).

(11) Approved or accepted respirators shall be used when they are available. The respirator furnished shall provide adequate respiratory protection against the particular hazard for which it is designed in accordance with standards established by competent authorities. The U.S. Department of Interior, Bureau of Mines, and the U.S. Department of Agriculture are recognized as such authorities. Although respirators listed by the U.S. Department of Agriculture continue to be acceptable for protection against specified pesticides, the U.S. Department of the Interior, Bureau of Mines, is the agency now responsible for testing and approving pesticide respirators.

(c) *Selection of respirators.* Proper selection of respirators shall be made according to the guidance of American National Standard Practices for Respiratory Protection Z88.2-1969.

(d) *Air quality.* (1) Compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration shall be of high purity. Oxygen shall meet the requirements of the United States Pharmacopoeia for medical or breathing oxygen. Breathing air shall meet at least the requirements of the specification for Grade D breathing air as described in Compressed Gas Association Commodity Specification G-7.1-1966. Compressed oxygen shall not be used in supplied-air respirators or in open circuit self-contained breathing apparatus that have previously used compressed air. Oxygen must never be used with air line respirators.

(2) Breathing air may be supplied to respirators from cylinders or air compressors.

(i) Cylinders shall be tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR Part 178).

(ii) The compressor for supplying air shall be equipped with necessary safety and standby devices. A breathing air-type compressor shall be used. Compressors shall be constructed and situated so as to avoid entry of contaminated air into the system and suitable in-line air purifying sorbent beds and filters installed to further assure breathing air quality. A receiver of sufficient capacity to enable the respirator wearer to escape from a contaminated atmosphere in event of compressor failure, and alarms to indicate compressor failure and overheating shall be installed in the system. If an oil-lubricated compressor is used, it shall have a high-temperature or carbon monoxide alarm, or both. If only a high-temperature alarm is used, the air from the compressor shall be frequently tested for carbon monoxide to insure that it meets the specifications in subparagraph (1) of this paragraph.

(3) Air line couplings shall be incompatible with outlets for other gas systems to prevent inadvertent servicing of air line respirators with nonrespirable gases or oxygen.

(4) Breathing gas containers shall be marked in accordance with American

National Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained, Z48.1-1954; Federal Specification BB-A-1034a, June 21, 1968, Air, Compressed for Breathing Purposes; or Interim Federal Specification GG-B-00675b, April 27, 1965, Breathing Apparatus, Self-Contained.

(e) *Use of respirators.* (1) Standard procedures shall be developed for respirator use. These should include all information and guidance necessary for their proper selection, use, and care. Possible emergency and routine uses of respirators should be anticipated and planned for.

(2) The correct respirator shall be specified for each job. The respirator type is usually specified in the work procedures by a qualified individual supervising the respiratory protective program. The individual issuing them shall be adequately instructed to insure that the correct respirator is issued. Each respirator permanently assigned to an individual should be durably marked to indicate to whom it was assigned. This mark shall not affect the respirator performance in any way. The date of issuance should be recorded.

(3) Written procedures shall be prepared covering safe use of respirators in dangerous atmospheres that might be encountered in normal operations or in emergencies. Personnel shall be familiar with these procedures and the available respirators.

(i) In areas where the wearer, with failure of the respirator, could be overcome by a toxic or oxygen-deficient atmosphere, at least one additional man shall be present. Communications (visual, voice, or signal line) shall be maintained between both or all individuals present. Planning shall be such that one individual will be unaffected by any likely incident and have the proper rescue equipment to be able to assist the other(s) in case of emergency.

(ii) When self-contained breathing apparatus or hose masks with blowers are used in atmospheres immediately dangerous to life or health, standby men must be present with suitable rescue equipment.

(iii) Persons using air line respirators in atmospheres immediately hazardous to life or health shall be equipped with safety harnesses and safety lines for lifting or removing persons from hazardous atmospheres or other and equivalent provisions for the rescue of persons from hazardous atmospheres shall be used. A standby man or men with suitable self-contained breathing apparatus shall be at the nearest fresh air base for emergency rescue.

(4) Respiratory protection is no better than the respirator in use, even though it is worn conscientiously. Frequent random inspections shall be conducted by a qualified individual to assure that respirators are properly selected, used, cleaned, and maintained.

(5) For safe use of any respirator, it is essential that the user be properly instructed in its selection, use, and maintenance. Both supervisors and workers

shall be so instructed by competent persons. Training shall provide the men an opportunity to handle the respirator, have it fitted properly, test its face-piece-to-face seal, wear it in normal air for a long familiarity period, and, finally, to wear it in a test atmosphere.

(i) Every respirator wearer shall receive fitting instructions including demonstrations and practice in how the respirator should be worn, how to adjust it, and how to determine if it fits properly. Respirators shall not be worn when conditions prevent a good face seal. Such conditions may be a growth of beard, sideburns, a skull cap that projects under the facepiece, or temple pieces on glasses. Also, the absence of one or both dentures can seriously affect the fit of a facepiece. The worker's diligence in observing these factors shall be evaluated by periodic check. To assure proper protection, the facepiece fit shall be checked by the wearer each time he puts on the respirator. This may be done by following the manufacturer's facepiece fitting instructions.

(ii) Providing respiratory protection for individuals wearing corrective glasses is a serious problem. A proper seal cannot be established if the temple bars of eye glasses extend through the sealing edge of the full facepiece. As a temporary measure, glasses with short temple bars or without temple bars may be taped to the wearer's head. Wearing of contact lenses in contaminated atmospheres with a respirator shall not be allowed. Systems have been developed for mounting corrective lenses inside full facepieces. When a workman must wear corrective lenses as part of the facepiece, the facepiece and lenses shall be fitted by qualified individuals to provide good vision, comfort, and a gas-tight seal.

(iii) If corrective spectacles or goggles are required, they shall be worn so as not to affect the fit of the facepiece. Proper selection of equipment will minimize or avoid this problem.

(f) *Maintenance and care of respirators.* (1) A program for maintenance and care of respirators shall be adjusted to the type of plant, working conditions, and hazards involved, and shall include the following basic services:

- (i) Inspection for defects (including a leak check),
- (ii) Cleaning and disinfecting.
- (iii) Repair,
- (iv) Storage

Equipment shall be properly maintained to retain its original effectiveness.

(2) (i) All respirators shall be inspected routinely before and after each use. A respirator that is not routinely used but is kept ready for emergency use shall be inspected after each use and at least monthly to assure that it is in satisfactory working condition.

(ii) Self-contained breathing apparatus shall be inspected monthly. Air and oxygen cylinders shall be fully charged according to the manufacturer's instructions. It shall be determined that the regulator and warning devices function properly.

(iii) Respirator inspection shall include a check of the tightness of connections and the condition of the facepiece, headbands, valves, connecting tube, and canisters. Rubber or elastomer parts shall be inspected for pliability and signs of deterioration. Stretching and manipulating rubber or elastomer parts with a massaging action will keep them pliable and flexible and prevent them from taking a set during storage.

(iv) A record shall be kept of inspection dates and findings for respirators maintained for emergency use.

(3) Routinely used respirators shall be collected, cleaned, and disinfected as frequently as necessary to insure that proper protection is provided for the wearer. Each worker should be briefed on the cleaning procedure and be assured that he will always receive a clean and disinfected respirator. Such assurances are of greatest significance when respirators are not individually assigned to workers. Respirators maintained for emergency use shall be cleaned and disinfected after each use.

(4) Replacement or repairs shall be done only by experienced persons with parts designed for the respirator. No attempt shall be made to replace components or to make adjustment or repairs beyond the manufacturer's recommendations. Reducing or admission valves or regulators shall be returned to the manufacturer or to a trained technician for adjustment or repair.

(5) (i) After inspection, cleaning, and necessary repair, respirators shall be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators placed at stations and work areas for emergency use should be quickly accessible at all times and should be stored in compartments built for the purpose. The compartments should be clearly marked. Routinely used respirators, such as dust respirators, may be placed in plastic bags. Respirators should not be stored in such places as lockers or tool boxes unless they are in carrying cases or cartons.

(ii) Respirators should be packed or stored so that the facepiece and exhalation valve will rest in a normal position and function will not be impaired by the elastomer setting in an abnormal position.

(iii) Instructions for proper storage of emergency respirators, such as gas masks and self-contained breathing apparatus, are found in "use and care"

instructions usually mounted inside the carrying case lid.

(g) *Identification of gas mask canisters.* (1) The primary means of identifying a gas mask canister shall be by means of properly worded labels. The secondary means of identifying a gas mask canister shall be by a color code.

(2) All who issue or use gas masks falling within the scope of this section shall see that all gas mask canisters purchased or used by them are properly labeled and colored in accordance with these requirements before they are placed in service and that the labels and colors are properly maintained at all times thereafter until the canisters have completely served their purpose.

(3) On each canister shall appear in bold letters the following:

(i) —
Canister for -----
(Name for atmospheric contaminant)
or
Type N Gas Mask Canister

(ii) In addition, essentially the following wording shall appear beneath the appropriate phrase on the canister label: "For respiratory protection in atmospheres containing not more than ----- percent by volume of -----"

(Name of atmospheric contaminant)
(iii) All of the markings specified above should be placed on the most conspicuous surface or surfaces of the canister.

(4) Canisters having a special high-efficiency filter for protection against radionuclides and other highly toxic particulates shall be labeled with a statement of the type and degree of protection afforded by the filter. The label shall be affixed to the neck end of, or to the gray stripe which is around and near the top of, the canister. The degree of protection shall be marked as the percent of penetration of the canister by a 0.3-micron-diameter dioctyl phthalate (DOP) smoke at a flow rate of 85 liters per minute.

(5) Each canister shall have a label warning that gas masks should be used only in atmospheres containing sufficient oxygen to support life (at least 16 percent by volume), since gas mask canisters are only designed to neutralize or remove contaminants from the air.

(6) Each gas mask canister shall be painted a distinctive color or combination of colors indicated in Table I-1. All colors used shall be such that they are clearly identifiable by the user and clearly distinguishable from one another. The color coating used shall offer a high degree of resistance to chipping, scaling, peeling, blistering, fading, and the effects of the ordinary atmospheres to which they may be exposed under normal conditions of storage and use. Appropriately colored pressure sensitive tape may be used for the stripes.



0-2801 (2-74)
SHELL OIL COMPANY
INDUSTRIAL HYGIENE
SAMPLING FORM

1142 A
4114
BOX REC

AMPLIFIED BY

PAGE OF
Ransdell
ACCOUNT NO.
SAMPLE NO.
1329-12-2

EMPLOYEE (NAME & NO.)

SSA
DPMC - REEFY - Sandblast Yard

DATE
10-6-75

SSA

CONTAMINANT
Free Silica

TYPE SAMPLE
☒ PERSONAL
☐ AREA
☐ SOURCE

AREA SAMPLED

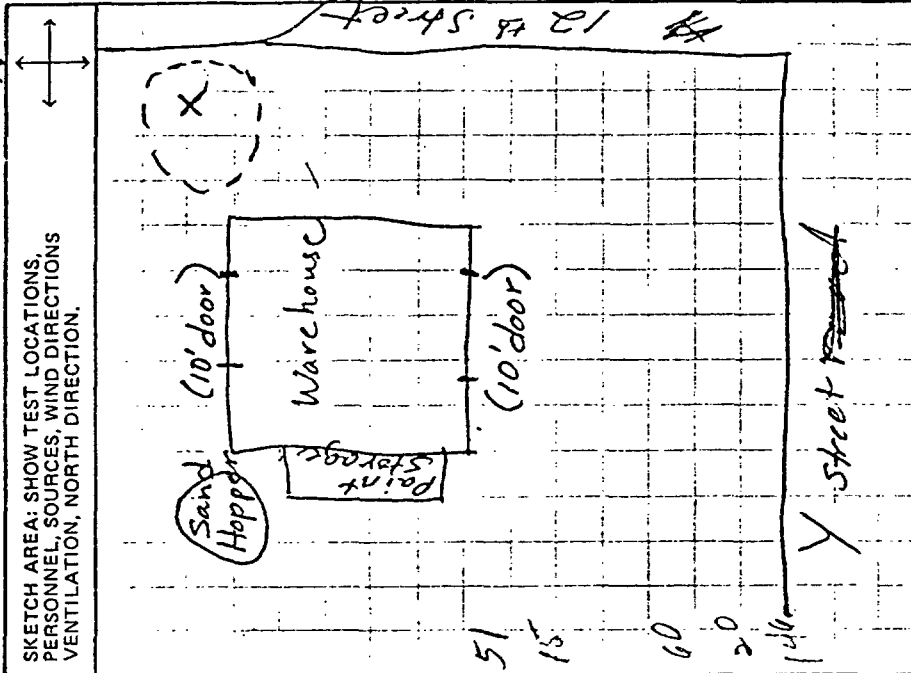
Marked "X" on the diagram

WEATHER CONDITIONS	WIND		TEMPERATURE	
	BAROMETER	TO GROUND	HUMIDITY	TO EMPLOYEE
SOURCE DISTANCE	TO GROUND		TO EMPLOYEE	
	TIME STARTED		TIME AT TASK	
8:44	Started sampler -- sandblasting		65-80°F	
	small sections of pipe			
9:35	Stopped sandblasting & took break			
	10:12 resumed sandblasting on bottle rack			
10:27	Completed sandblasting & returned to the shed			
	12:40pm Started sandblasting			
1:40pm	Stopped sandblasting & returned to shed			
	3:10 pm to 3:30 pm Sandblasting			
3:30 pm	Stopped			

INSTRUMENT TYPE & NO.		FLOW RATE		VOLUME SAMPLED	
MSA Model C		S/N C-05-0538		1.8 lpm	
CALIBRATED BY		DATE		METER READING	
Ransdell		10-3-75		730 liters	
INITIALS		FINAL		DETECTOR TUBE READING	

REMARKS:
Wearing Cescor hood; sampled inside hood

13-1000



LAB ANALYSIS		DATE	BY
0.094		2/10 4/3/2	J.F.M.
REMARKS:			
FREE SILICA 0.023 mg/m ³			
2/10			



SHELL OIL COMPANY
INDUSTRIAL HYGIENE
SAMPLING FORM

1 H L 10

41 4
BOX

DATE

SAMPLED BY

Ransdell

ACCOUNT NO.

DATE

10-8-75

JOB CLASSIFICATION

Painter

LANT/FACILITY

7PMC-REFY--Sandblast Yard

CONTAMINANT

Free Silica

TYPE SAMPLE

☒ PERSONAL

AREA

SOURCE

Respirable

AREA SAMPLED

Marked "X" on diagram

WEATHER
CONDITIONS

WIND

E at 5mph

TEMPERATURE

70°-75°F

SOURCE
DISTANCE

TO GROUND

TO EMPLOYEE

TIME
STARTED

WORK TASKS

TIME AT
TASK

7:58 Started -- began sandblasting
5' diameter segment of pipe stack
approximately 10'-15' long
8:27 Stopped blasting & removed hood
Turned segment
8:37 Resumed sandblasting
Completed job & stopped sample 57 min
8:55

INSTRUMENT TYPE & NO.

Begdux C-115

CALIBRATED BY

Ransdell

FLOW RATE

1.8 lpm

METER READING

INITIAL: FINAL:

VOLUME SAMPLED

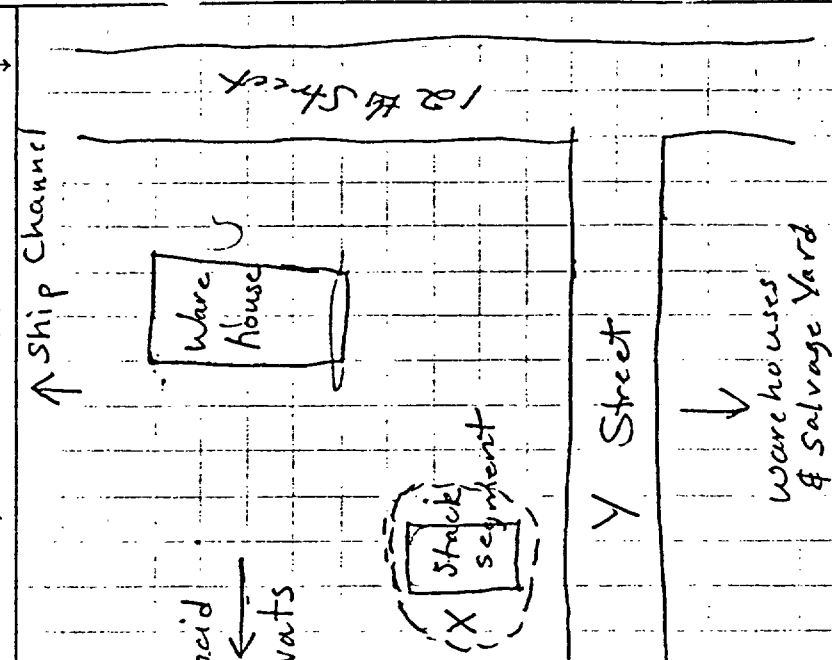
100 liters

DETECTOR TUBE READING

REMARKS:

was wearing Ceresco hood; hood was in good
repair & was properly installed. No. 4
Clemtex Sand was used; sampled inside
hood

SKETCH AREA: SHOW TEST LOCATIONS,
PERSONNEL, SOURCES, WIND DIRECTIONS
VENTILATION, NORTH DIRECTION.



LAB ANALYSIS

DATE

BY

0.18

mg/m³

0.71M

REMARKS:

FREE SILICA 0.0070 mg/m³
3.9%



0-2801 (2-7-4)
SHELL OIL COMPANY
INDUSTRIAL HYGIENE
SAMPLING FORM

114 L 201 BOX 41 4
BPC

DESIGN NUMBER
PAGE OF

SAMPLE NO.
1329-12-7

PLANT/FACILITY

599 OPMC-REFY--Sandblast yard

ACCOUNT NO.

DATE

10-8-75

JOB CLASSIFICATION

Sand blaster

CONTAMINANT
Free silica

TYPE
SAMPLE

☒ PERSONAL

☐ AREA

☐ SOURCE

Respirable

AREA SAMPLED

NE corner of yard--blasting of
small pieces

WEATHER CONDITIONS SE	WIND. E, SE at 5mph	TEMPERATURE. 70°-80°F
BAROMETER.		HUMIDITY.
SOURCE DISTANCE	TO GROUND	TO EMPLOYEE

TIME STARTED	WORK TASKS	TIME AT TASK
-----------------	------------	-----------------

9:59	Started.	
------	----------	--

	sand blasting screens & valves	
--	--------------------------------	--

11:00am	Stopped to move pallets of cleaned material	
---------	--	--

11:12am	Resumed sand blasting	
---------	-----------------------	--

11:30	Stopped sand blasting	1:31
-------	-----------------------	------

--	--	--

--	--	--

--	--	--

--	--	--

INSTRUMENT TYPE & NO.

MSA Model G S/N C-05-0538

FLOW RATE 1.8 lpm

VOLUME SAMPLED 160 liters

CALIBRATED BY

DATE 10-8-75

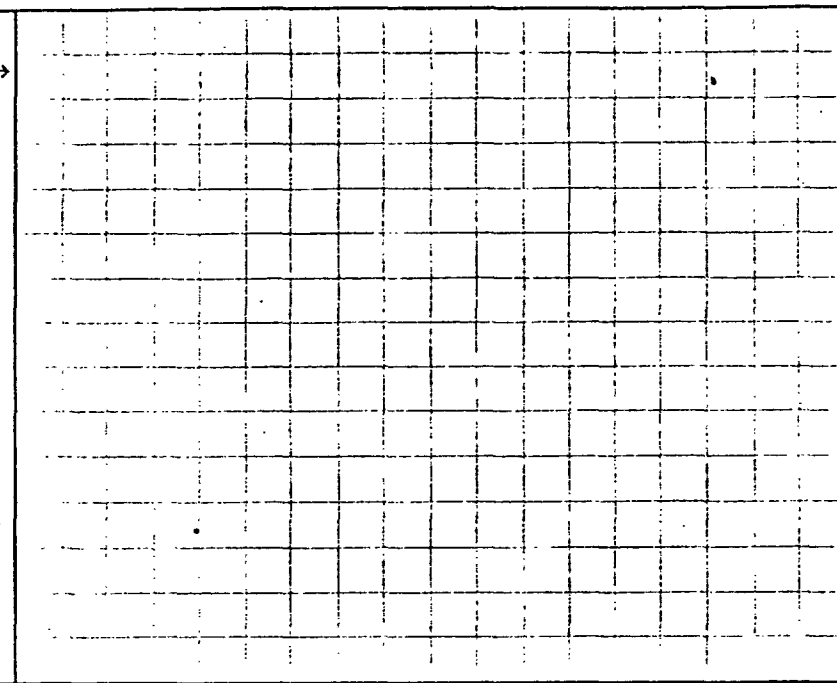
METER READING INITIAL: FINAL:

DETECTOR TUBE READING

REMARKS:

Wore Cessco hood; Hood did not have the
cloth border which is drawn up around the
neck; air supply to hood ~~was~~ seemed weak
to 5 ft. or 10 ft. Sand was used; sampled inside
hood.

SKETCH AREA: SHOW TEST LOCATIONS,
PERSONNEL, SOURCES, WIND DIRECTIONS
VENTILATION, NORTH DIRECTION.



LAB ANALYSIS

DATE

BY

0.48 ^{ppm} mg/m³

12/3 A.M.

REMARKS:

FREE SILICA 0.138 mg/m³

25%



0-2801 (2-7-74)
SHELL OIL COMPANY
INDUSTRIAL HYGIENE
SAMPLING FORM

14L 201 BOX 7117
BRC

ULINUM IIVUINQ

PAGE 1

AMPLED BY *Parsdell*

SAMPLE NO. 1329-12-9

ACCOUNT NO.

DATE 10-8-75

PLANT/FACILITY *DPMC - REFV -- Sandblast Yard*

JOB CLASSIFICATION

Sandblaster

CONTAMINANT

Free Silica

TYPE SAMPLE

☒ PERSONAL

☐ AREA

☐ SOURCE

Respirable

AREA SAMPLED

NE corner of yard

WEATHER CONDITIONS

WIND *SSE at 5-10 mph*

TEMPERATURE *80°-85°F*

SOURCE DISTANCE

TO GROUND

TO EMPLOYEE

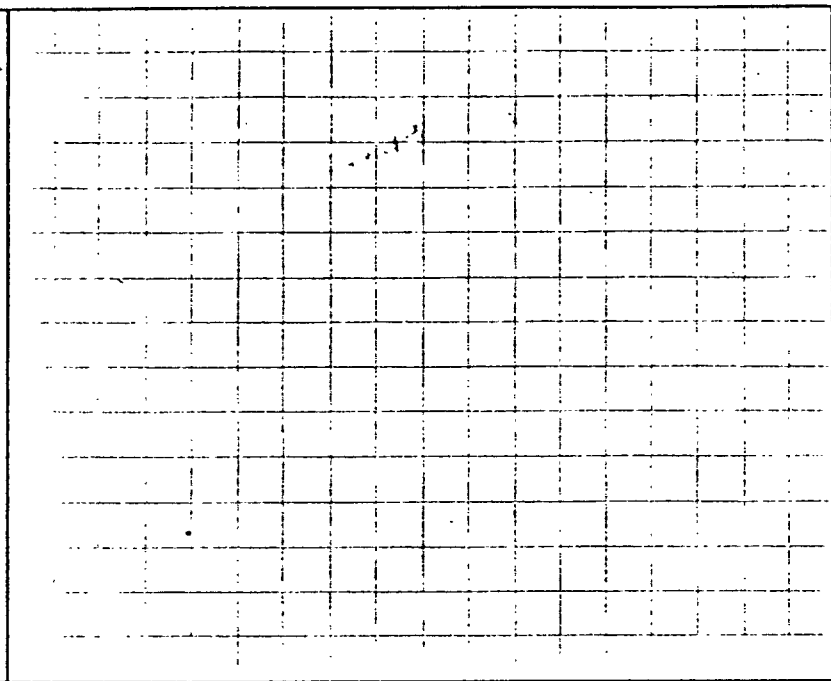
TIME STARTED

WORK TASKS

TIME AT TASK

12:53 pm	Started sample	
1:45 pm	Sandblasting small items	
1:45 pm	Stop sandblasting & took coffee break (stopped sample)	52
2:09 pm	Resumed sandblasting (started sample)	31
2:40 pm	Break for coffee (stopped sample)	
3:02 pm	Resumed sandblasting (started sample)	33
3:35 pm	Completed sandblasting (stopped sample)	116

SKETCH AREA: SHOW TEST LOCATIONS, PERSONNEL, SOURCES, WIND DIRECTIONS VENTILATION, NORTH DIRECTION.



INSTRUMENT TYPE & NO.

MSA Model G SH C-05-0538

FLOW RATE

1.8 lpm

VOLUME SAMPLED

210 liters

CALIBRATED BY

DATE 10-8-75

METER READING

INITIAL:

FINAL:

DETECTOR TUBE READING

REMARKS:

Used both Air & Al. 4 Clemtex Sand fibre Cessco hood but inside liner was removed and sides were not attached as designed. Sampled inside hood

LAB ANALYSIS

0.24

432

AM

DATE

BY

REMARKS:

FREE SILICA 0.081 mg/m³

34%



0-2801 (2-74)
SHELL OIL COMPANY
INDUSTRIAL HYGIENE
SAMPLING FORM

14 L 20

41 4

BOX
BRC

PLANT/FACILITY
DPMC - REEFY - Sandblast Yard

CONTAMINANT
Free Silica

APPLIED BY
FRANZDELL

ACCOUNT NO.

SAMPLE NO.
1329-12-10

DATE
10-8-75

TYPE
SAMPLE

PERSONAL ☐ AREA ☐ SOURCE ☐

JOB CLASSIFICATION

EMPLOYEE (NAME & NO.)

AREA SAMPLED

Sample blank

WEATHER
CONDITIONS

WIND-
BAROMETER-

TEMPERATURE-
HUMIDITY-

SOURCE
DISTANCE

TO GROUND

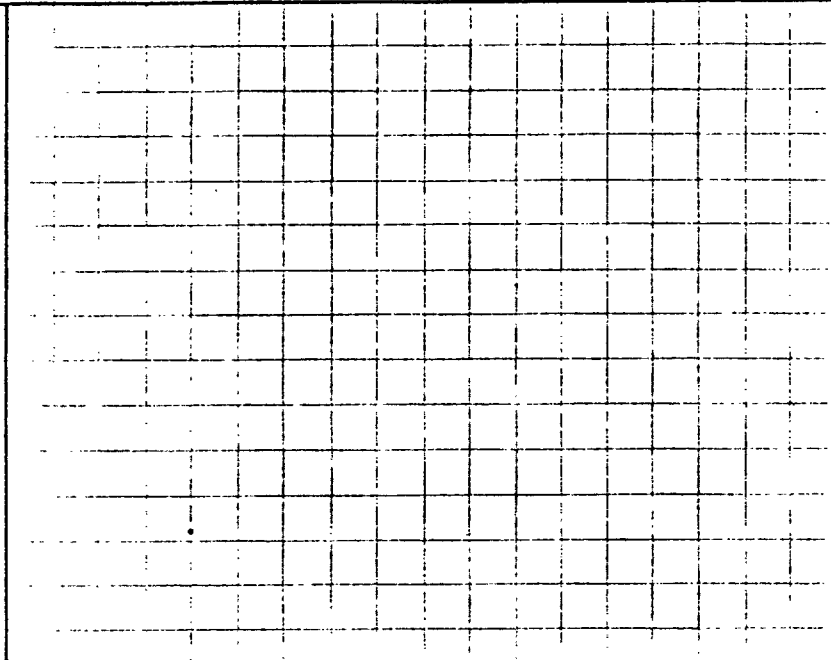
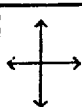
TO EMPLOYEE

TIME
STARTED

WORK TASKS

TIME AT
TASK

SKETCH AREA: SHOW TEST LOCATIONS,
PERSONNEL, SOURCES, WIND DIRECTIONS
VENTILATION, NORTH DIRECTION.



INSTRUMENT TYPE & NO.

FLOW RATE

VOLUME SAMPLED

CALIBRATED BY

DATE

METER READING

INITIAL: FINAL:

DETECTOR TUBE READING

REMARKS:

Cassette was transported to the field
with all other cassettes during samplings
then sealed & shipped with all field
samples

LAB ANALYSIS

DATE

BY

PPM

mg/m³

REMARKS:

FREE SILICA 0.0009 mg.

DPMC-00763

LAM 007255



0.2801 (2.7.4)
SHELL OIL COMPANY
INDUSTRIAL HYGIENE
SAMPLING FORM

114-201 BOX 4114
199 REC

DENVER HOURS

EMPLOYEE (NAME & NO.)

PLANT/FACILITY

DEPMC - REEFY - Sandblast yard

CONTAMINANT
Free Silica

SAMPLED BY
Hunsdell
ACCOUNT NO.
DATE
10-8-75

TYPE
SAMPLE
☒ PERSONAL
☐ AREA
☐ SOURCE

Respirable

AREA SAMPLED

NE corner of yard

WEATHER
CONDITIONS

WIND- S SE at 5-10 mph
BAROMETER-

TEMPERATURE- 80°-85°F
HUMIDITY-

SOURCE
DISTANCE

TO GROUND

TO EMPLOYEE

TIME
STARTED

WORK TASKS

TIME AT
TASK

12:53 pm Started sample
sandblasting small items

1:45 pm Stop sandblasting at tank coffee
break (stopped sample)

2:09 pm Resumed sandblasting (started sample)

2:40 pm Break for coffee (stopped sample)

3:02 pm Resumed sandblasting (started sample)

3:35 pm Completed sandblasting (stopped sample)

33
116

INSTRUMENT TYPE & NO.

FLOW RATE

VOLUME SAMPLED

1154 Model G SN C-05-0538
CALIBRATED BY DATE METER READING

1.8 gpm

210 liters

REMARKS:

DATE INITIAL:

FINAL:

Used both No. 5 & No. 4 Clements Sand
where Cessco had but inside liner was
removed and sides were not attached
as designed, sampled inside hood

SKETCH AREA: SHOW TEST LOCATIONS,
PERSONNEL, SOURCES, WIND DIRECTIONS
VENTILATION, NORTH DIRECTION.



DPMC-00765

LAB ANALYSIS

DATE

BY

0.34

mg/m³

4/28

J.M.M.

REMARKS:



0-2801 (2-7-74)
SHELL OIL COMPANY
INDUSTRIAL HYGIENE
SAMPLING FORM

DATE RECEIVED
11/1/74

BOX
820

DEPT. HOURS
PAGE
OF

SAMPLED BY
Ransdell

SAMPLE NO.
1329-12-7

JOB CLASSIFICATION
Sand blaster

CONTAMINANT
Free Silica

ACCOUNT NO.
DATE
10-8-75

☒ PERSONAL ☐ AREA ☐ SOURCE
Respirable

AREA SAMPLED

NE corner of yard -- blasting of
small pieces

WEATHER
CONDITIONS
SE WIND E, SE at 5 mph
TEMPERATURE 70°-80°F
HUMIDITY

SOURCE
DISTANCE
TO GROUND
TO EMPLOYEE

TIME
STARTED
WORK TASKS
TIME AT
TASK

9:59 Started.

sand blasting screens & valves

11:00am Stopped to move pallets of
cleared material

11:12am Resumed sand blasting

11:30 Stopped sand blasting 1:31

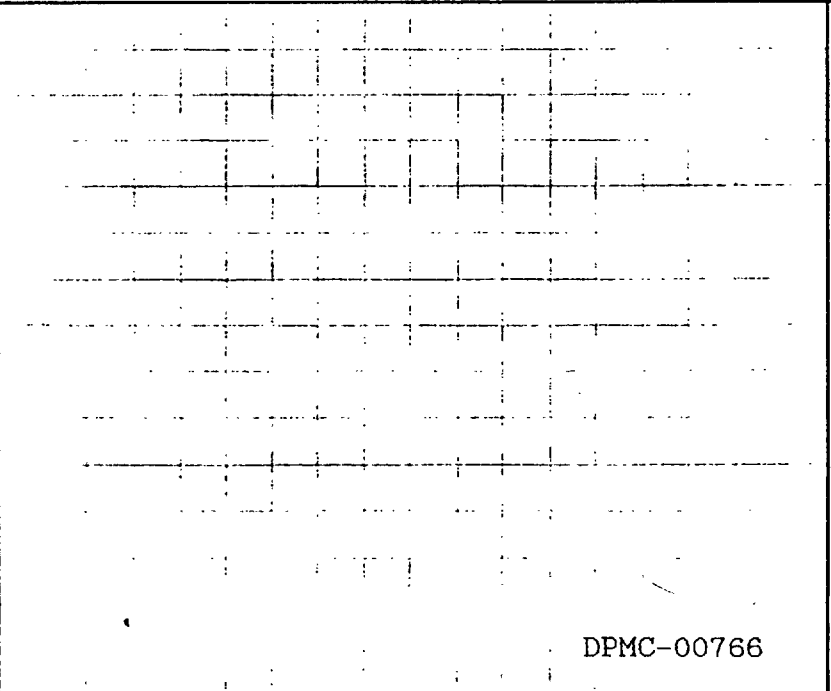
INSTRUMENT TYPE & NO.
MSA Model G S/N C-05-0538
FLOW RATE
1.8 lpm
VOLUME SAMPLED
160 liters

CALIBRATED BY
Ransdell
DATE
10-8-75
METER READING
INITIALS
FINAL
DETECTOR TUBE READING

REMARKS:

More Cessco Head; head did not have the
cloth border which is drawn up around the
neck; air supply to head ~~was~~ seemed weak
filling No. 5 on No. 5 sand was used; sampled inside
head

SKETCH AREA: SHOW TEST LOCATIONS,
PERSONNEL, SOURCES, WIND DIRECTIONS,
VENTILATION, NORTH DIRECTION.



DPMC-00766

LAB ANALYSIS
DATE
BY

0.48 mg/m³ 12/12 P. 2 PM

REMARKS:



0-2801 (2-74)
SHELL OIL COMPANY
INDUSTRIAL HYGIENE
SAMPLING FORM

114 L 199

DATE RECEIVED
41 1 4

DEWITT HUIKIS

PAGE OF

SAMPLED BY

Handell

SAMPLE NO. 10-8-75

EM

PLANT/FACILITY

OPMC - KEY - Sandblast Yard

ACCOUNT NO.

DATE 10-8-75

JOB CLASSIFICATION

CONTAMINANT

TYPE SAMPLE

PERSONAL ☒ AREA ☐ SOURCE ☐

AREA SAMPLED

Marked "X" on diagram

WEATHER CONDITIONS

WIND: E at 5mph
BAROMETER:

TEMPERATURE: 70-75°F
HUMIDITY:

SOURCE DISTANCE

TO GROUND

TO EMPLOYEE

TIME STARTED

WORK TASKS

TIME AT TASK

7:58 Started -- began sandblasting

5' diameter segment of pipe stack

8:27 Stopped blasting & removed hood

Turned segment

8:37 Resumed sandblasting

8:55 Completed job & stopped sample 57min

INSTRUMENT TYPE & NO.

Bendix C-115

S/N 1427

FLOW RATE

VOLUME SAMPLED

1.8 lpm

100 liters

CALIBRATED BY

Handell

DATE

METER READING

INITIAL:

FINAL:

DETECTOR TUBE READING

REMARKS:

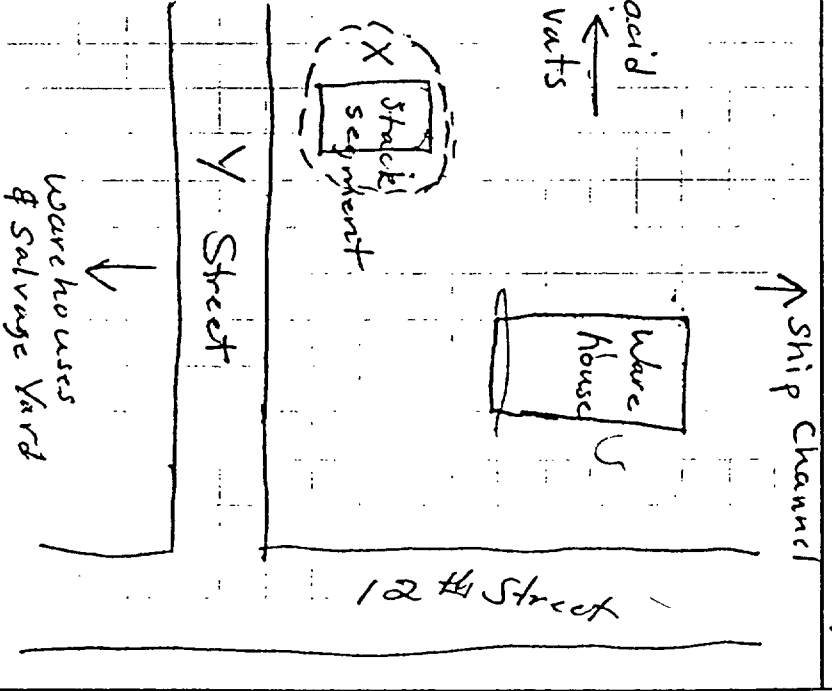
was wearing Cessco hood & hood was in good

repair & was properly installed. At 8:44

Clamtex Sand was used & sampled inside

hood

SKETCH AREA: SHOW TEST LOCATIONS, PERSONNEL, SOURCES, WIND DIRECTIONS, VENTILATION, NORTH DIRECTION.



LAB ANALYSIS

DATE

BY

0.18

mg/m³

4/3/2

J. Z. M

REMARKS:



02801 (2-74)
SHELL OIL COMPANY
INDUSTRIAL HYGIENE
SAMPLING FORM

DATE RECEIVED
11/14/75

BOX
BRC

DEPINH NUMBER

PAGE 1 OF 1
SAMPLER BY
Kanehell
CHEM ADP SAMPLE NO.
Room 104 1329-132-5
ACCOUNT NO.
DATE
10-6-75

EMPLOYEE (NAME & NO.)	PLANT/FACILITY	CONTAMINANT
	DPMC-AEFY--Sandblast Yard	Free Silica
JOB CLASSIFICATION	TYPE SAMPLE ☐ PERSONAL ☒ AREA ☐ SOURCE	

AREA SAMPLED	Sketch Area: Show Test Locations, Personnel, Sources, Wind Directions, Ventilation, North Direction.
DPMC-00768	

WEATHER CONDITIONS	WIND	BAROMETER	TEMPERATURE	HUMIDITY
	11 at 5 mph		70°-80°F	
SOURCE DISTANCE	TO GROUND	TO EMPLOYEE	TIME AT TASK	
TIME STARTED	10:15 am	Started		
	11:24 am	Stop	39	
	2:20 pm	Started		
	2:40 pm	Stop	20	
	2:50 pm	Started		
	3:15 pm	Stop	25	
			84	

INSTRUMENT TYPE & NO.	Flow Rate	Volume Sampled
Brady C-115	5/11/27	1.8 lpm
Calibrated by	Date	Meter Reading
Kanehell	10-3-75	Initial: Final:
REMARKS:	There was no sandblasting during this sampling period; this sample measures the worker's exposure during breaks and lunch.	
LAB ANALYSIS	DATE	BY
0.17	12/2	DDM
REMARKS:		



0-2801 (2-7-74)
SHELL OIL COMPANY
INDUSTRIAL HYGIENE
SAMPLING FORM

14 L 197

41 4
BOX
BCC

DEWEN HUBB

PAGE 1 OF 1
SAMPLER BY
Kensell
54211 C. H. H. SAMPLE NO. 4
1.329-12-75
DATE 10-6-75

EMPLOYEE NAME	CONTAMINANT	PLANT/FACILITY
JC Sandblaster SSN 460-10-1599	Free Silica	OPMC--REFF--Sandblast Yard

AREA SAMPLED	North East Corner of sandblast yard
--------------	-------------------------------------

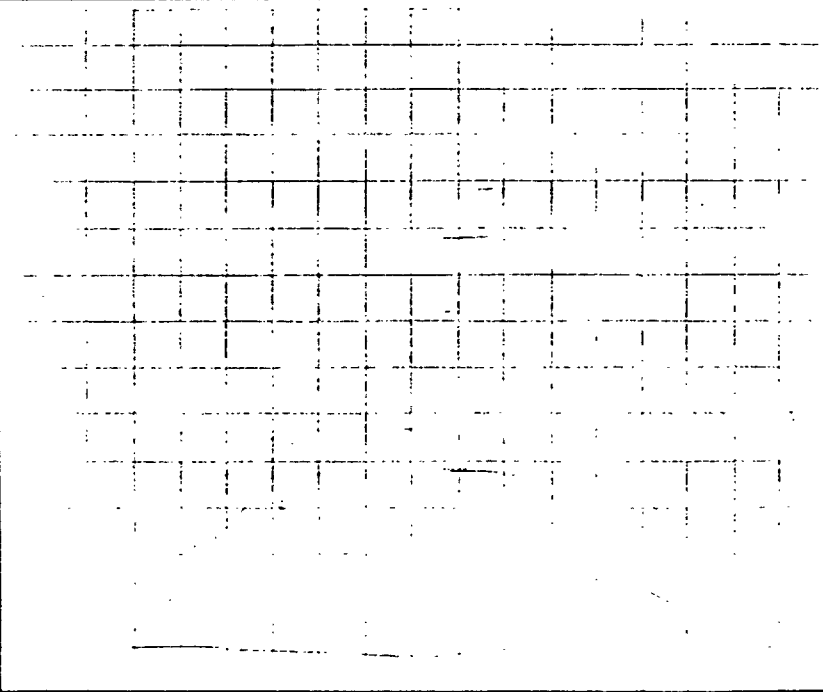
WEATHER CONDITIONS	WIND. N at 5 mph	TEMPERATURE. 70°F
SOURCE DISTANCE	TO GROUND	TO EMPLOYEE

TIME STARTED	WORK TASKS	TIME AT TASK
10:12	Started-- sand blasting	
10:15	Stopped to reposition piece	
10:17	Began sandblasting	
10:27	Stopped	15 min.

INSTRUMENT TYPE & NO.	Flow Rate	VOLUME SAMPLED
Bendix Micrair SN 5511	1.8 lpm	27 liters
CALIBRATED BY	DATE	METER READING
Kensell	10-3-75	INITIAL: FINAL:

REMARKS:	Walking around the piece sandblasted; removed all mud or squared; wear Cesset Sandblasting hood; used Cleante #4 and sampled inside hood
----------	--

SKETCH AREA: SHOW TEST LOCATIONS, PERSONNEL, SOURCES, WIND DIRECTIONS, VENTILATION, NORTH DIRECTION.



LAB ANALYSIS	DATE	BY
0.78 mg/m ³	12/2	A. J. M.

REMARKS:	
----------	--



0-2801 (2-7-74)
SHELL OIL COMPANY
INDUSTRIAL HYGIENE
SAMPLING FORM

REVISED 11/60

UNIT RECEIVED
4/14

PHONE - 110016

JOB CLASSIFICATION
SSA 1160-10-1599

PLANT/FACILITY
DPM - REEF - Sandblast Yard
CONTAMINANT
Free Silica

PAGE 1 OF 1
SAMPLED BY
Karside 11
ACCOUNT NO.
DATE
10-6-75
TYPE
SAMPLE
☒ PERSONAL
☐ AREA
☐ SOURCE

AREA SAMPLED
Marked "X" on the diagram

WEATHER CONDITIONS
WIND. N at 5 mph
BAROMETER.
TO GROUND
TEMPERATURE. 65-80°F
HUMIDITY.
TO EMPLOYEE

SOURCE DISTANCE
TIME STARTED
WORK TASKS
TIME AT TASK

8:44 Started sampler -- sandblasting
small sections of pipe
Climber 334

9:35 stopped sandblasting & took break
10:13 resumed sandblasting on bottle rack

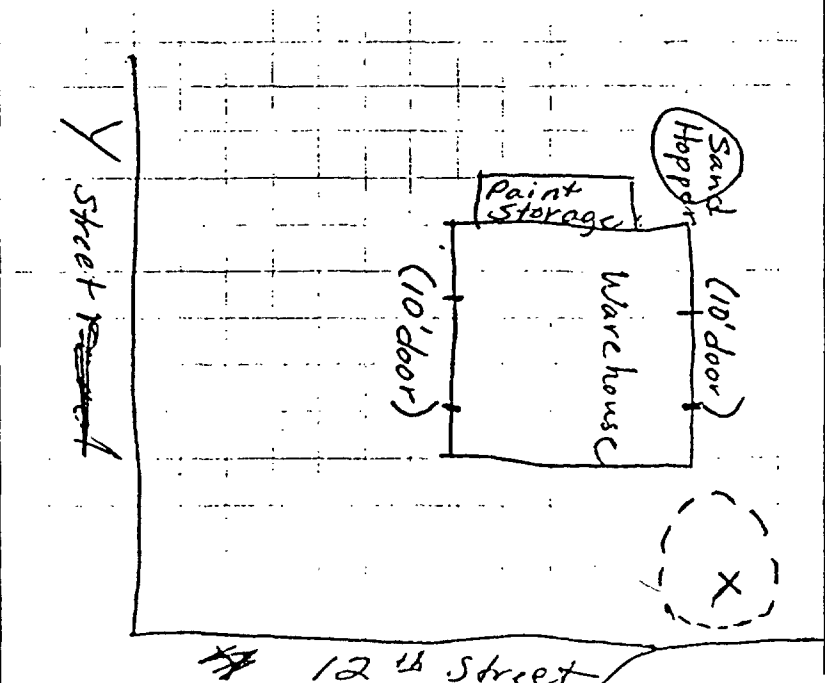
10:27 completed sandblasting & returned to the shed

12:40 pm Started sandblasting
1:40 pm stopped sandblasting & returned to shed
3:10 pm to 3:30 pm Sandblasting

3:30 pm stopped
INSTRUMENT TYPE & NO.
MS4 Model G
FLOW RATE
1.8 lpm
VOLUME SAMPLED
730 lts
CALIBRATED BY
Karside 11
DATE
10-3-75
METER READING
INITIAL:
FINAL:

REMARKS:
Leaving Case Hard; sampled inside hood

SKETCH AREA: SHOW TEST LOCATIONS,
PERSONNEL, SOURCES, WIND DIRECTIONS,
VENTILATION, NORTH DIRECTION.



LAB ANALYSIS
DATE
BY
0.094 mg/m³
4/3/75
JRM

DPMC-00770

LAM 007262



02801 (2-74)
SHELL OIL COMPANY
INDUSTRIAL HYGIENE
SAMPLING FORM

REQUEST NO. 144-195
DATE RECEIVED 4/1/74
BOX BRE

PAGE 1 OF 1
RECEIVED

SAMPLED BY
Ransdell

SAMPLE NO.
1329-12-8

JOB CLASSIFICATION
Painter

PLANT/FACILITY
OPMC - Ref - Sandhat Yard

CONTAMINANT
Total Particulate (Gravimetric)

DATE
4-8-75

AREA SAMPLED

SW corner of yard -- while painting a segment of boiler stack (6' dia, 15' long)

WEATHER CONDITIONS

WIND SSE at 5-10 mph

TEMPERATURE 75-85°F

SOURCE DISTANCE

TO GROUND

HUMIDITY

TO EMPLOYEE

TIME STARTED

WORK TASKS

TIME AT TASK

10:54 am Started

11:15 am stopped to turn stack segment 16

1:03 pm Resumed painting

1:17 pm Completed painting

14
30 min

SKETCH AREA: SHOW TEST LOCATIONS, PERSONNEL, SOURCES, WIND DIRECTIONS, VENTILATION, NORTH DIRECTION.



☒ PERSONAL ☐ AREA ☐ SOURCE

INSTRUMENT TYPE & NO.
Beardell 2-115 SW

DATE
10-8-75

METER READING
1.8/100

VOLUME SAMPLED
54 liters

DECKED BY
Ransdell

INITIALS

FINAL

REMARKS:
Spray painting Carbo Zinc 11

When McDonald supplied - Air hood stopped
painting; sampled inside
hood

LAB ANALYSIS

DATE

BY

41

mg/m³

43/3

A. J. M.

REMARKS:

LAM 007264

DPMC-00772