NORTH CAROLINA DEPARTMENT OF LABOR
OFFICE OF OCCUPATIONAL SAFETY AND HEALTH
RALEIGH, NORTH CAROLINA

October 15, 1976

Operational Procedure Notice 22

TO: OSHA Staff, Consultants, Supervisors, Safety Officers and Industrial Hygienists.

SUBJECT: OSHANC Sampling Methods for Carbon Monoxide, Asbestos, Silica, Lead, Vinyl Chloride and Coal Tar Pitch Volatiles.

1. Samples for Carbon Monoxide, Asbestos, Silica, Lead, Vinyl Chloride and Coal Tar Pitch Volatiles are to be taken in accordance with the attached Sampling Data Sheets.

2. The attached Data Sheets, as well as others to be prepared in the future, are provided to standarize the procedure for collecting and analyzing health samples. However certain situations will necessitate deviations from these methods and the best available technique will be used.

   OSHA N. C. will always accept new sampling techniques and analyses procedures that prove to be superior to existing methods.

Michael R. Peeler
OSHA Standards Engineer

R. P. Boylston
OSHA Director

HJDjr:MRP:ag

NORTH CAROLINA DEPARTMENT OF LABOR
OFFICE OF OCCUPATIONAL SAFETY AND HEALTH
RALEIGH, NORTH CAROLINA

CARBON MONOXIDE SAMPLING DATA SHEET #1

Standard: 29 CFR 1910.1000, Table Z-1

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

Sampling Equipment:

1) Direct-reading instrument (Energetics Science, Inc. "Ecolyzer" or Equivalent)

2) Certified or NIOSH approved detector tubes and a calibrated hand pump (not squeeze bulb).

Sampling Procedure:

1) Ecolyzer - a reasonable number of readings should be taken to determine the average exposure. Time required is dependent on variability and cyclical nature of exposures.

2) Detector Tubes - Normally used for screening purposes. Citations should be based on a minimum of eight samples taken at random over the exposure period. For longer exposure periods (4-8 hours) more samples are desirable.

ninent Danger:

Concentrations above 500 ppm (10 x TLV) for any length of time.

Serious Violation:

Any 8-hour time-weighted average above 150 ppm, or any 8-hour time-weighted average between 50 ppm and 150 ppm with levels exceeding 150 ppm for more than one hour.

Non-Serious Violation:

Any 8-hour time-weighted average exceeding 50 ppm but not meeting the criteria for a serious violation or imminent danger.

De Minimis Violation:

Not applicable.

10/15/76
O.P.N. 22

NORTH CAROLINA DEPARTMENT OF LABOR
OFFICE OF OCCUPATIONA SAFETY AND HEALTH
RALEIGH, NORTH CAROLINA

ASBESTOS SAMPLING DATA SHEET #2

Standard: 29 CFR 1910.1001(b)

8 hour time-weighted average: 2 fibers longer than 5 microns, per cubic centimeter of air.

Ceiling concentration: 10 fibers, longer than 5 microns, per cubic centimeter of air.

Analytical Method:

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

Samplin g Procedure:

1) Samples collected on millipore type AA filters (37 mm, 0.8 µ pore size), in open-faced 3 piece cassettes attached face down to the workmen's clothing. Calibrated personal sampling pumps will be used at 1.5 - 2.0 l/min.

2) Submit two blanks with each batch of samples. Blank filters should be subjected to exactly the same treatment as the sample filters except no air is drawn through them.

3) Several samples totaling at least 4 hours and preferably 6 hours shall be taken for evaluation of an 8 hour average. A minimum period of 15 minutes must be sampled for evaluation of the ceiling limit. Samples with a visible deposit may be too heavy to count. Dust concentrations must be taken into account when planning individual sample periods.

Imminent Danger:

Generally not applicable.

Serious Violation:

Any 8 hour time-weighted average greater than 5 fibers longer than 5 microns, per cubic centimeter of air.

Non-Serious Violation:

Any 8 hour time-weighted average greater than 2 fibers and less than 5 fibers longer than 5 microns, per cubic centimeter of air.

De Minimis Violation:

Not applicable.

10/15/76
O.P.N.22

NORTH CAROLINA DEPARTMENT OF LABOR
OFFICE OF OCCUPATIONAL SAFETY AND HEALTH
RALEIGH, NORTH CAROLINA

RESPIRABLE FREE SILICA SAMPLING DATA SHEET #3

Standard: 29 CFR 1910.1000, Table Z-3

8-hour time-weighted average, respirable quartz: $\frac{10\ mg/m^3}{\%SiO_2 + 2}$

Cristobalite, Tridymite: One-half the value for quartz.

Analytical Method:

1) Net weight of airborne respirable dust, weighed to 0.01 mg.

2) $\%SiO_2$ (free silica) determined by one of the following methods:

- Colorimetric Talvitie
  Minimum sample 2.5 mg dust, 20 μg SiO_2

- Infra-red Spectroscopy
  Minimum sample 0.5 mg dust, 20 μg SiO_2

Sampling Procedure:

For worker exposure -

1) Samples taken on pre-weighed MSA FWS-B polyvinyl chloride filters (or equivalent) in 2-piece cassettes following 10 mm nylon cyclones attached to the workmen's clothing. Personal sampling pumps will be used at 1.7 l/min.

2) Submit two blanks with each batch of samples. Blank filters should be subjected to exactly the same treatment as sample filters except that no air is drawn through them.

3) Two or more samples totaling six hours or more should be taken. Employees who are exposed for less time should be sampled during their entire exposure time, if possible, and the balance of their shift accounted for.

4) Filters should not be allowed to load with dust to the point that material might fall off or the filter become plugged. The minimum sample sizes requested by the laboratory (listed above) should also be considered in planning of sampling.

For free silica determination -

1) Samples submitted for free silica analysis must be representative of the dust to which the employee sampled is exposed. Where employees are sampled in different areas or occupations this may require several free silica determinations.

2) Personal samples will ordinarily be used for free silica analysis. More than one filter may be combined, if necessary, only if the filters are representative of the same dust source.

3) Where insufficient dust may be collected by personal samplers, samples may be collected at representative fixed locations using 1/2 inch steel cyclones at 9 l/min. in place of the 10 mm nylon cyclones at 1.7 l/min. Area samples will be used for free silica determination only.

4) Rafter samples may be used only when samples of airborne respirable dust are insufficient or defective.

Imminent Danger:

Not applicable.

Serious Violation:

An 8-hour time-weighted average greater than four times the standard for an identified worker.

Non-Serious Violation:

An 8-hour time-weighted average between the standard and four times the standard.

De Minimis Violation:

Not applicable.

10/15/76

O.P.N. 22

NORTH CAROLINA DEPARTMENT OF LABOR
OFFICE OF OCCUPATIONAL SAFETY AND HEALTH
RALEIGH, NORTH CAROLINA

LEAD SAMPLING DATA SHEET #4

Standard: 29 CFR 1910.1000 Table Z-2

8-hour time-weighted average: 0.2 mg/m^3 lead and its inorganic compounds.

Analytical Method:

Atomic absorption spectroscopy.
Detection limit is approximately 0.01 mg/m^3 lead for a 100 liter air sample.

Sampling Procedure:

1) Samples taken on Millipore AAWP filters (or equivalent) in 2- or 3-piece filter cassettes attached face-down to the workmen's clothing. Personal sampling pumps will be used at 1.5 - 2.0 l/min.

2) Submit two blanks with each batch of samples. Blank filters should be subjected to exactly the same treatment as sample filters except that no air is drawn through them.

3) A minimum sample of 100 liters should be collected. Two or more samples totaling six hours or more should be taken. Employees who are exposed for less time should be sampled during their entire exposure time, if possible, and the balance of their shift accounted for.

4) Filters should not be allowed to load with dust to the point that material might fall off or the filter become plugged.

Imminent Danger:

Not applicable.

Serious Violation:

An 8-hour time-weighted average above 0.6 mg/m^3 for an identified worker.

Non-Serious Violation:

An 8-hour time-weighted average between 0.2 mg/m^3 and 0.6 mg/m^3 for an identified worker.

De Minimis Violation:

Not applicable.

10/15/76
O.P.N. 22

NORTH CAROLINA DEPARTMENT OF LABOR
OFFICE OF OCCUPATIONAL SAFETY AND HEALTH
RALEIGH, NORTH CAROLINA

VINYL CHLORIDE SAMPLING DATA SHEET #6

Standard: 29 CFR 1910.1017

8-hour time-weighted average not to exceed 1 ppm. Average over any period up to 15 minutes not to exceed 5 ppm. Action level: 8-hour time-weighted average of 0.5 ppm.

Analytical Method:

1) Absorption on charcoal, desorption with carbon disulfide, analysis by gas chromatograph.
2) Detector tubes.

Sampling Procedure:

1) Detector tube samples may be taken to determine the need for compliance monitoring and to identify employees to be sampled.

2) Personal samples will be taken by using personal sampling pumps to draw air through charcoal tubes worn by the workers. Immediately before sampling, the ends of the tube are broken to provide an opening at least one-half the internal diameter of the tube. The smaller section of charcoal is used as a backup and is positioned nearest the sampling pump. The charcoal tube is placed in a vertical position during sampling to prevent channeling of the charcoal. Air being sampled is not to be passed through any hose or tubing before entering the charcoal tube. The charcoal tubes are capped with the supplied plastic caps immediately after sampling.

3) 8-hour time-weighted average exposures will be determined by sampling six or more hours on each employee sampled. Workers sampled who are exposed to vinyl chloride for less than six hours are to be sampled during their entire exposure time if possible. Employee activities during working time not sampled are to be accounted for in the report. A calibrated flow rate of approximately 50 ml/min. should be used. Samples should not exceed 5 liters.

Ceiling exposures will be determined by sampling for 15 minutes. 50 ml/min. or a higher calibrated flow rate up to 200 ml/min. may be used. Samples should not exceed 5 liters.

4) One blank tube is to be submitted with each batch of samples. This tube is handled in the same manner as the sample tubes (break, seal and transport) except that no air is drawn through it.

5) Samples not delivered to the laboratory within 24 hours require cooling with dry ice. Dry ice may be obtained from the laboratory if advance notice is given. Samples not requiring cooling in dry ice should be kept in as cool a location as is available.

10/15/76
O.P.N. 22

NORTH CAROLINA DEPARTMENT OF LABOR
OFFICE OF OCCUPATIONAL SAFETY AND HEALTH
RALEIGH, NORTH CAROLINA

COAL TAR PITCH VOLATILES SAMPLING DATA SHEET #7

Standard: 29 CFR 1910.1000, Table Z-1

8-hour time-weighted average: 0.2 mg/m^3 coal tar pitch volatiles (benzene soluble fraction)

Analytical Method:

Weight of benzene soluble fraction of collected material.

Sampling Procedure:

1) Samples collected on a pre-extracted Reeves-Angel fiberglass filters (or equivalent) backed by 0.8 μ silver membrane filters in open-faced 3 piece cassettes attached face down to the workmen's clothing. Calibrated personal sampling pumps will be used at 1.5 - 2.0 l/min.

2) Submit two blanks with each batch of samples. Blank filters should be subjected to exactly the same treatment as the sample filters except no air is drawn through them.

3) Sample(s) totaling six or more hours are to be taken on each employee sampled. Employees sampled who are exposed to CTPV's for less than six hours will be sampled during their entire exposure time, if possible. Employee activities during working time not sampled will be accounted for in the report.

4) Sampling should be planned so as to collect a minimum of 0.1 to 0.2 mg CTPV's on each filter if possible.

5) An area sample representative of contaminants to which employees are exposed should be taken in each work area. Area samples will not be used for enforcement except to demonstrate the presence of CTPV's in the work area.

Imminent Danger:

Not applicable.

Serious Violation:

An 8-hour time-weighted average above 0.6 mg/m^3 for an identified worker unless approved respirators are properly used in accordance with 29 CFR 1910.134.

Non-Serious Violation:

An 8-hour time-weighted average above 0.2 mg/m^3 but not over 0.6 mg/m^3 for an identified worker, or above 0.6 mg/m^3 if approved respirators are properly used in compliance with 29 CFR 1910.134.

De Minimis Violation:

Not Applicable.