PLAINTIFF'S EXHIBIT

G-593

Report of Findings

Exposure Assessment: An Evaluation of the Actual Contribution of Airborne Asbestos Fibers from the Fabrication of Gaskets

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Prepared for:
Steven Parrott, Esquire
Parrott and Donahue
18 West Street
Annapolis, Maryland 21401

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Prepared by:

EPI
John W. Spencer, CIH, CSP
813 Frederick Road
Baltimore, Maryland 21228
(410) 744-0700
(410) 744-2003 Fax
Homepage: www.episervices.com
email: spencer@episervices.com

An Evaluation of the Actual Contribution of Airborne Asbestos Fibers from the Fabrication of Gaskets

Purpose

This study was conducted for Parrott and Donahue to determine the concentration of fibers in air during the fabrication of gaskets from sheet stock. The evaluation included six days of testing, with five days dedicated to gasket fabrication and one day dedicated to the installation of gaskets. The work was performed on 7, 8, 9, 14, and 15 July 1998.

New products used in the evaluation included those produced by Garlock Sealing Technologies, Houston, TX. Specifically, Garlock 900 Sheet was used in 1/16" and 1/32" thicknesses.

Method

The study was conducted in an isolation chamber constructed of tube scaffolding and 6 mil polyethylene sheeting. The chamber measured approximately 20'x20'x10', or 4000 cubic feet. A skilled tradesman performed the fabrication and installation of gaskets in a static environment (e.g. no ventilation or air circulation) within the chamber.

Prior to initiating the evaluation, the chamber was cleaned with amended water and was then encapsulated. Air samples were then collected and analyzed via Transmission Electron Microscopy (TEM) in order to document the level of cleanliness and to establish baseline conditions. The TEM method chosen for evaluating baseline conditions was NIOSH method 7402.

Subsequent to each day of testing, the chamber was cleaned with amended water and encapsulated. Air samples were collected for evaluation by TEM in order to document the level of cleanliness and to establish baseline conditions for the next day of testing.

During each day of the evaluation, air monitoring was conducted. Air samples were collected inside of the chamber, outside of the chamber, and on the personnel performing the work. Eight area samples were collected inside of the chamber. The samples were located equidistant from the center of the chamber at 5 and 10-foot intervals, and were placed at points SE, SW, NE, and NW from the center. Two air samples were collected at the outside entrance to the chamber, and two samples each were collected on personnel performing the work. The personal air samples were collected using two (2) sampling pumps on each individual. Two blank samples were also submitted for analysis, for a daily average total of 16 air samples. The daily area air samples were analyzed using NIOSH method 7400. The daily personal air samples were analyzed using the OSHA Reference method in conjunction with the NIOSH 7400 method.

Bulk samples of each gasket material used were collected and analyzed by PLM for asbestos content and type.

The following procedures were used on each day of the evaluation:

TEST DAY 1 - Forming Gaskets with Ball Peen Hammer

- Cut gasket sheet stock to a useable size with a utility knife
- Placed usable gasket portion over flange face
- Pounded against gasket material, flange face & bolt holes with ball peen hammer
- Repeated once per hour for the remaining 7 hours
- Used a 4 bolt hole flange for the first 4 gaskets and an 8 bolt hole flange for the remaining 4 gaskets.

TEST DAY 2 - Forming Gaskets with a Scribe/Circular Cutter

- Cut gasket sheet stock to a useable size with a utility knife
- Placed usable gasket portion on work bench
- Formed and cut the gasket outer diameter and then the inner diameter with the scribe/circular cutter
- Punched the bolt holes with a hollow punch
- Repeated once per hour for the remaining 7 hours
- Used a 4 bolt hole gasket pattern for the first 4 gaskets and an 8 bolt hole gasket pattern for the remaining 4 gaskets.

TEST DAY 3 – Forming Gaskets with Ball Peen Hammer, Hand Shears, and Scribe/Circular Cutter

Ball Peen Hammer

- Cut gasket sheet stock to a useable size with a utility knife
- Placed usable gasket portion over flange face
- Pounded against gasket material, flange face & bolt holes with ball peen hammer
- Repeated 2 more times consecutively within the hour

Hand Sheers

- Cut gasket sheet stock to a useable size with a pair of hand shears
- Placed usable gasket portion on work bench
- Traced the gasket outline and marked the bolt hole locations with a pencil using a previously fabricated gasket
- Cut and shaped gasket to proper size and shape with hand shears
- Punched bolt holes with a hollow punch
- Repeated 2 more times consecutively within the hour

Scribe/Circular Cutter

- Cut gasket sheet stock to a useable size with a utility knife

- Placed usable gasket portion on work bench
- Formed and cut the gasket outer diameter and then the inner diameter with the scribe/circular cutter
- Punched the bolt holes with a hollow punch
- Repeated 2 more times consecutively within the hour.

TEST DAY 4– Installation of Gaskets

- Gaskets used for installation were those fabricated earlier in this assessment
- Gasket placed onto pipe flange and aligned
- Companion flange placed over gasket
- Fed bolts through holes
- Threaded nuts over bolts and hand tightened
- Nuts/bolts tightened with wrench.
- Flange loosened, nuts/bolts removed, flange separated, gasket removed
- Repeated once per hour for 3 more hours, then installed and removed 4 gaskets consecutively in a one-hour period.

TEST DAY 5– Forming Gaskets with a Pocket Knife

- Cut gasket sheet stock to a useable size with a pocket knife
- Placed usable gasket portion on work bench
- Traced the gasket outline and marked the bolt hole locations with a pencil using a previously fabricated gasket
- Formed the gasket and bolt holes by cutting with the pocketknife
- Repeated once per hour for the remaining 7 hours
- Used a 4 bolt hole gasket pattern for the first 4 gaskets and an 8 bolt hole gasket pattern for the remaining 4 gaskets.

TEST DAY 6 - Forming Gaskets with Hand Sheers

- Cut gasket sheet stock to a useable size with a pair of hand shears
- Placed usable gasket portion on work bench
- Traced the gasket outline and marked the bolt hole locations with a pencil using a previously fabricated gasket
- Cut and shaped gasket to proper size and shape with hand shears
- Punched bolt holes with a hollow punch
- Repeated once per hour for the remaining 7 hours

Results

The results of air sampling and analysis indicated that all air sample results were below the Occupational Safety and Health Administration (OSHA) 8-hour Time Weighted Average (TWA) Permissible Exposure Limit (PEL) of 0.1 fibers per cubic centimeter (f/cc). The results of PLM analysis indicated that the gasket materials used for this evaluation contained chrysotile asbestos at an average concentration of 60% by weight.

Three tables of data are included as supplements to this report. Table I lists the air sample results for each day of testing. All air sample results are expressed as 8-hour TWA concentrations. Tables II shows the results of PLM analysis for the gasket materials.

Table I - Air Sample Results Summary (f/cc)*

Location	*Day 1*	*Day 2*	*Day 3*	*Day 4*	*Day 5*	*Day 6*
Process	*Ball Peen Hammer*	*Scribe*	*Ball Peen Hammer, Hand Shears, Scribe*	*Installation*	*Pocket Knife*	*Hand Shears*
10' SE	0.005	0.006	0.006	0.010	0.003	<0.002
10' SW	0.003	0.005	0.005	0.010	0.004	<0.002
5' SE	<0.002	0.004	0.004	0.009	0.004	<0.002
5' SW	0.005	0.005	0.008	0.012	0.004	<0.002
5' NE	0.003	0.005	0.005	0.008	0.002	<0.002
5' NW	0.004	0.005	0.005	0.009	0.003	<0.002
10' NE	0.003	0.002	0.004	0.011	0.004	<0.002
10' NW	0.002	0.004	0.005	0.012	<0.002	0.005
Mean	**0.004**	**0.005**	**0.006**	**0.011**	**0.004**	**0.003**
⊖Pipefitter - TWA	0.005	0.008	<0.008 <0.045◊	0.015 <0.045◊	0.004	0.006
⊖Helper- TWA	0.013	0.006	0.008 <0.045◊	0.008 0.053◊	0.004	<0.003
Outside (SE)	<0.002	<0.002	<0.002	0.006	<0.002	<0.002
Outside (SW)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

* All sample results are expressed as 8-hour time weighted averages.

⊖ Since 2 air samples were collected on the worker and the helper each day, the values expressed here are an average of the 2 daily sample results.

◊ 30-minute excursion sample for comparison with Short-Term Exposure Limit (STEL) of 1.0 f/cc.

Table II - Bulk Sample Analysis Summary of Gasket Material

Material Description	*Analytical Result (asbestos % by weight)*
Garlock 900 Sheet, 1/16" thickness	50% chrysotile
Garlock 900 Sheet, 1/32" thickness	60% chrysotile