

Health Risk among Roof Tile Manufacturing Workers Caused by Asbestos

Assoc. Prof. Wantanee Phanprasit
Dept. of Occupational Health and Safety
Faculty of Public Health, Mahidol University
Bangkok, Thailand

Asbestos known health effects

- **Lung cancer**
- **Mesothelioma**
- **Asbestosis**

Rational

- Although **less toxic substitutes for asbestos** has been researched and used more and more, asbestos-cement roof sheet is still preferred in many countries due to its **inexpensive and several good properties** e.g. durable, strong, reduce heat from the sun.
- Asbestos cement roof sheet has been classified as **non-friable asbestos containing material** (ACM) which do not generally release fiber **unless damage**.
- However, workers in the asbestos cement roof sheet factory could expose to asbestos at **high concentration**.


Objectives

- **To assess asbestos exposure and to estimate lifetime cancer risk among asbestos-cement roof sheet workers.**

- **The study was conducted in **four factories** where the manufacturing processes were similar.**

Manufacturing process:

- **Processes and activities:**
 - unloading & transfer asbestos bags from the containers to warehouse
 - loading asbestos bag to de-bagger
 - mixing and roll forming
 - separate cement sheet from the mold
 - polishing the roof fitting molds using sand-paper
 - loading products to trucks and
 - asbestos and products testing in laboratory.

A photograph showing two workers in blue shirts and jeans unloading large white bags from the back of a truck. The bags are stacked high. In the foreground, there are several wooden pallets stacked on a metal stand. A staircase is visible on the left side of the truck. The scene is outdoors, likely at a construction or industrial site.

Unloading Asbestos bags



Transfer Asbestos bags to warehouse



Loading to De-bagger – Manual Lifting

Loading to De-bagger – Vacuum lifting





Product Testing in Laboratory



Polishing the roof fitting molds using sand-paper



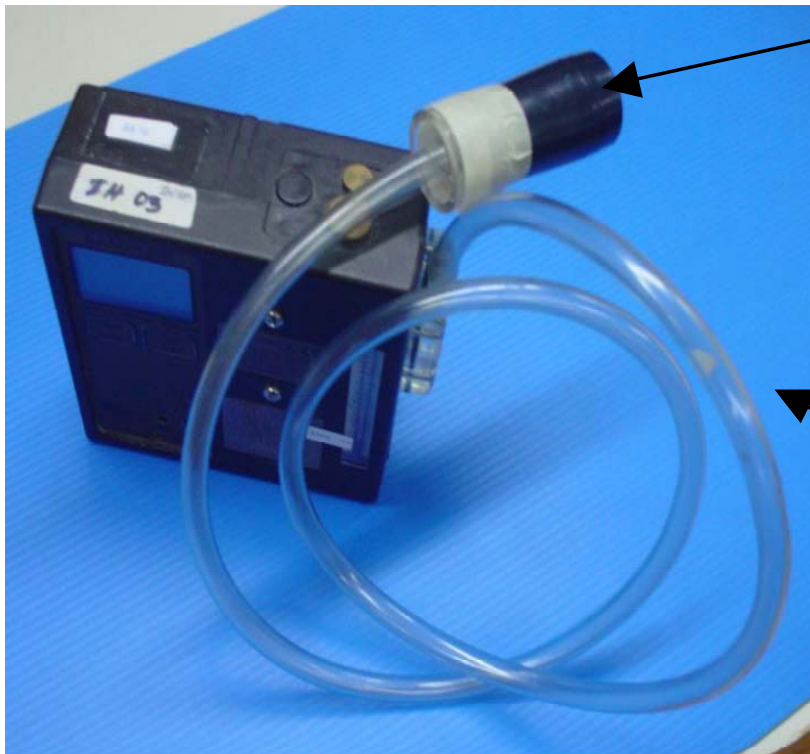
Polishing the roof fittings using sand-paper



Loading Finished Products to truck

Air Sampling Method:

- NIOSH Method # 7400 and Counting rule A



Open face for
sample collection

Connect tube to
the pump

Lifetime Cancer Risk

$$\text{LCR} = \text{IUR} \times \text{Conc}_L$$

Where:

EPA: Inhalation Unit Risk (IUR) = 0.23/f/cm³

$$\text{Conc.L} = \frac{\text{no. of lifetime inhaled asbestos fibers}}{\text{Lifetime inhaled air volume}}$$

Given:

- Inhale volume: $10 \text{ m}^3/8 \text{ hrs}$ in workplace;
- Exposure duration: 280 days/yr.;
- Exposure situation: 8 hrs/day
(6 hrs on specific duty and 2 hrs in the plant);
- Exposure duration: 40 yrs.;
- Life expectancy: 70 yrs.

Results:

Personal samples	Min. f/cm³	Max. f/cm³	Avg. f/cm³	#
Unload asbestos bags from container	0.00	0.015	0.008	3
Folklift driver	0.00	0.017	0.004	4
Placing asbestos bags on conveyor to de-baggers	0.003	0.082	0.042	4
Polishing roof fittings	-	-	0.729	1
Check and Load products to truck	0.001	0.082	0.027	4
Laboratory staff	0.002	0.025	0.012	3

Results: (Cont.)

Area Samples	Min. f/cm ³	Max. f/cm ³	Avg. f/cm ³	#
Asbestos warehouse*	0.00	0.027	0.005	8
Asbestos warehouse	0.00	0.001	0.000	3
Conveyor to de-bagger	0.00	0.058	0.021	4
Mixing and Forming roll areas	0.003	0.019	0.009	3
Separate sheets from molds	0.00	0.006	0.002	4
Roof fittings packing area	-	-	0.027	1
Finished Products warehouse	0.000	0.019	0.007	4
Laboratory	0.000	0.004	0.002	4

***during loading asbestos bag from container to warehouse*

TWA and LCR

Duties	TWA (f/cm³)	LCR
Unload asbestos bags from container	0.008	4.55 x 10 ⁻⁴
Folklift driver	0.005	2.90 x 10 ⁻⁴
Placing asbestos bags on conveyor to the de-baggers	0.034	18.63 x 10 ⁻⁴
Polishing roof fittings	0.549	303.05 x 10 ⁻⁴
Check & Load cement sheets to truck	0.023	12.42 x 10 ⁻⁴
Laboratory staff	0.011	6.21 x 10 ⁻⁴

Conclusion and Discussion:

- Airborne asbestos concentration in cement sheet manufacturers were **quite low** compare to other types of industry such as textile, friction and mining.

Conclusion and Discussion:

The reasons could be:

- 1) Wet process
- 2) Most of dusty process was enclosed,
e.g. asbestos bags opening, and
- 3) Good practice.

Conclusion and Discussion:

- **According to the observation unloading asbestos bags from container, especially manually, seemed to have lower exposure than 0.015 f/cm^3 .**
 - **It was possible that the fibers packed tightly in the bags; they were stick together in large crumb and hardly flyable.**
 - **The task was performed in open air area.**

Conclusion and Discussion:

- While **polishing roof fittings** liberated fibers from the sheet and the worker's face was closed to the fittings. Thus, **fiber concentration was the highest.**

Conclusion and Discussion:

- Based on the same given situation, the highest asbestos **lifetime cancer risk** was among those workers who performing polishing cement sheet, i.e. **roof fitting polisher**.
- Therefore, better control measures for this process and de-bagging of asbestos bags are needed