# ASBESTOS SURVEY
# PITTSBURGH-CORNING CORPORATION
# TYLER, TEXAS

PROJECT NO: 71-45
DATE: 12/7/71

# N.I.O.S.H. SURVEY
# PITTSBURGH-CORNING CORPORATION
# TYLER, TEXAS
# OCTOBER 26 - 29, 1971

Study requested by:

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Texas State Health Department
Austin, Texas

Local 4202
Oil, Chemical, and Atomic International Workers

Study conducted by:

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SUMMARY OF REPORT

During the week of October 26 - 29, 1971, the National Institute for Occupational Safety and Health conducted a comprehensive industrial hygiene and medical survey of the Pittsburgh-Corning Corporation amosite asbestos thermal pipe insulation plant in Tyler, Texas.

The survey pointed out major industrial hygiene deficiencies which included a grossly inadequate ventilation system and poor housekeeping practices. Personal air samples yielded grossly excessive fiber concentrations. One hundred seventeen of 138 samples exceeded 5 fibers/ml for fibers $>5\mu$ in length.

The National Institute for Occupational Safety and Health medical questionnaires and examinations for rales and clubbing were conducted on 63 male employees in order to complement the X-rays and pulmonary function tests performed by Dr. George Hurst at the East Texas Chest Hospital in August 1971. Even without benefit of interpretation of the X-rays, 7 of 18 workers with 10 or more years employment meet at least 3 of 4 criteria for asbestosis, and reduced pulmonary function was observed in a few workers with less than 5 years employment.

In conclusion, an extremely serious and critical occupational health situation exists at this plant. Immediate corrective action is necessary to reduce asbestos exposures to conform to existing standards.

Appropriate recommendations are presented in this report. In all areas and operations except the office area, average and maximum concentrations of dust greatly exceeded the presently existing Threshold Limit Value of the American Conference of Governmental Industrial Hygienists and the Emergency Standards of the U. S. Department of Labor (see Table I).

## INTRODUCTION AND PURPOSE

On October 26 - 29, 1971, at the request of Mr. Martin C. Wukasch of the Texas State Health Department and Local 4202, Oil, Chemical, and Atomic Workers International Union, an environmental and medical survey was made of the Pittsburgh-Corning Corporation plant in Tyler, Texas. The survey was made to determine the level of asbestos dust in the working environment, to evaluate the existing environmental controls for asbestos and to conduct medical questionnaires and examinations for rales and finger clubbing. The study was conducted by the Division of Technical Services and the Division of Field Studies and Clinical Investigations of the National Institute for Occupational Safety and Health (NIOSH).

Previous industrial hygiene surveys for asbestos dust were made of this plant in March 1967 and January 1970. On both occasions the levels for asbestos dust greatly exceeded the threshold limit value (TLV) for asbestos dust as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH). In this study the asbestos dust was also grossly in excess of the existing TLV's (see Table I).

## DESCRIPTION OF PLANT AND MANUFACTURING OPERATIONS

The plant occupies two large buildings approximately 1000 ft. long and 50 ft. wide and covers approximately 100,000 sq. ft. The buildings are approximately 30 ft. high with corrugated metal roofs, a wooden shell, and concrete floors.

The plant employs 74 persons, including 62 hourly and 12 salaried employees. There are four major departments:

1. Production
2. Finishing
3. Shipping, Receiving and Warehouse
4. Maintenance

With the exception of the production department which operates three full shifts, the plant operates only one shift. In this plant asbestos insulation for pipe is manufactured from a variable mixture of asbestos (approximately 90%) and varying amounts of natural diatomaceous earth, sodium silicate and mineral wool.

The amosite asbestos used by Pittsburgh-Corning is mined in East Africa. It arrives at the Tyler plant by railroad cars packaged in polyethylene lined hissian bags with each bag weighing 110 lbs. After the materials are received they are stored and used as needed.

There is also a large inventory of "governmental surplus" amosite asbestos in the warehouse. This material is stored in burlap bags without the polyethylene liners. All types of used asbestos bags are sold to nursery companies to wrap trees or they are disposed of in the local dump.

When the materials are ready for processing they are placed in material feeders. There are 3 feeder lines with each line having 3 stations. Each station contains different materials. The first station contains the virgin amosite; the second contains mineral wool (at times the final formulation contains approximately 5% mineral wool). The third station contains scrap. (Scrap is regenerated asbestos and is approximately 25% of the formula.) The new bags of asbestos are placed on top of the feeder and cut with a knife and allowed to fall into the feed hopper. The scrap is removed from metal containers using a large fork and placed in the feeder hopper. Both systems generate excessive amounts of dust. The diatomaceous earth used in the formula (7%) is placed in large hoppers and fed by auger to the conveyor system.

After the material is placed in the feeder hoppers it is transported by conveyor belts to the attrition mill which opens the amosite fibers and blends all the ingredients together. From the attrition mill the material is transported through ducts to the cyclone where the heavy material is separated out and the light material is recycled to the attrition mill. From the cyclone the heavy material goes to the building machines.

In the building machine, through a system of spiked belts and lay belts, a lap is formed. The lap is a dry mass of the total blend of the raw materials. Controlling the speed of the spike belt determines the thickness of the lap. The material then goes through a mechanical rake to smooth the lap; it is then sprayed with sodium silicate. After the lap is sprayed it exits the building machine and is rolled on a mandrel to desired size. Sand or Perlite is applied at the beginning of the roll to ease the mandrel from the finished roll. It then goes to the finishing mill. From the finishing machine it goes to the coating machine where a clay coating is applied.

At the building machine in the roll-up process, small amounts of the material cling to the lap belt and are scraped off the bottom side of the turn around drum. This material is gathered up, loaded on a truck and dumped in a large field adjacent to the plant as waste. At the present time no provisions have been made to bury this material. This practice has been carried out for at least 15 years. This produces a serious air pollution problem.

After the rolls have been clay coated they are removed from the mandrel and put into a drying room. From the drying oven the rolls go to the finishing department where the ends are sawed off, split down the middle, bound together with string, packaged and then removed to the warehouse for storage.

ENVIRONMENTAL STUDY PROCEDURES AND INSTRUMENTATION

Atmospheric samples for fiber count were collected on Millipore filters, Type AA*, encased in three-piece plastic Millipore aerosol field monitor with face cap removed and filter completely exposed. The samples were taken at the operators' breathing zone using battery powered Mine Safety Appliance (MSA) gravimetric pumps, Type G. The pumps and samplers were worn by the employees. The pumps were calibrated to operate at 1.7 liters/minute with each sample being taken for one hour. Each employee on each shift was sampled at least twice, with some employees on the first shift being samples three times.

Ventilation measurements were made using pitot static tubes and a magnehelic gauge. A ten-point traverse was attempted on the larger ducts with a six-point traverse on ducts six inches or smaller. A more detailed report of the ventilation system will appear later in this report. Face velocity measurements were made on hoods using a thermal anemometer.

Noise measurements were also made of the plant using a General Radio sound level meter, Type 1665-A, calibrated at the time of this study. No readings were found to be above 85dBA.

TOXICOLOGY AND HYGIENIC STANDARDS

Asbestos is a general name given to a variety of fiberous minerals. The major asbestos minerals are chrysotile, crocidolite, amosite and anthophyllite. Asbestosis, lung cancer, pleural and peritoneal mesotheliomas may follow exposure to asbestos. The risk is related to the length of exposure and the dust concentration.

*Registered trade name of the Millipore Corp., Bedford, Massachusetts

The Threshold Limit Value (TLV)* for asbestos dust, as listed in the Threshold Limit Values for 1971 of the ACGIH is 5 million particles per cubic foot of air. In 1968, the U.S. Department of Labor (Walsh-Healey Act) promulgated a standard limit of 12 fibers per ml of asbestos, for fibers $>5\mu$ in length. On December 7, 1971, the U.S. Department of Labor established an "Emergency Standard for Asbestos Dust Exposure of 5 fibers per milliliter, $>5\mu$ in length for an eitht-hour weighted exposure. The ceiling exposure conditions shall not exceed 10 fibers per milliliter $>5\mu$ in length."

RESULTS OF STUDY

A total of 138 personal samples were taken of the various operations at the Tyler plant. These samples were analyzed in the Cincinnati laboratory of NIOSH. Each of the membrane filters were rendered transparent using a 50:50 mixture of dimethyl phthalate and diethyl ozalate and counted using a 4 mm (43X) phase contrast objective 400X magnification and phase contrast illumination. Counts were recorded for all fibers $>5\mu$.

Of the total of 138 samples taken, 117 exceed the presently accepted Hygienic Standards of 5 fibers/ml of air and $>5\mu$ in length. In all areas and operations, except the office area. average and maximum concentrations of dust greatly exceeded the presently existing TLV of the ACGIH and the Emergency Standard of the U.S. Department of Labor. (see Table I.)

The plant was in very poor condition including housekeeping, health hazards, ventilation, and storage and disposal methods. Each aspect will be discussed below.

*TLV Booklet. Threshold limit values refer to airborne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect. Because of wide variation in individual susceptibility, however, a small percentage of workers may experience discomfort from some substances at concentrations at or below the threshold limit, a smaller percentage may be affected more seriously by aggravation of a pre-existing condition or by development of an occupational illness.

HOUSEKEEPING

The housekeeping was very poor. At the time of our arrival, when a walk-through survey was made, the floors, ceilings and rafters had an excessive amount of dust on them. The drinking fountains and eye bubblers were very dirty as were the rest rooms. There were also small piles of dust around the machines that had been swept there by the operators using push brooms. Thus, asbestos dust was re-disbersed into the work atmosphere.

VENTILATION

The ventilation system, as a whole, was found to be grossly inadequate. Some of the deficiencies are listed below.

1. Blast gates were closed.
2. Small ducts on all three feeder stations were plugged.
3. Large holes in main and auxiliary ducts and in the bag collectors.
4. Conveyor system from feeders to attrition mills have large separations in the facility.
5. Many of the ducts are disfigured, probably caused by bumping by machinery.
6. Holes in ducts were repaired by applying Permagum, a putty like substance.
7. Too many 90° entries were attached to the main ducts, which can cause excessive air turbulance and static pressure losses.

An attempt was made to do a pitot traverse of the ventilation system. This was impossible since the ducts on each of the three feeder stations were plugged. Static pressure reading could not be made due to holes in the blower housing and the bag collectors.

SCRAP GRINDER

The scrap grinder is located north of the feeder stations. Scrap from various operations are ground up to be reused in the process. The operator must lift the pieces of scrap above his head to feed the grinder. After the scrap is ground up it is deposited in a metal container approximately 4' x 4' with wheels. After the container is full it is removed and then taken to the feeder stations where it is reintroduced into the process. The grinding operation was very dusty and the ventilation was insufficient. Velocity across the face of the opening was only 20-30 ft./minute (fpm). A slot at the floor level was pulling approximately 200 fpm but is incorrectly placed; it should be located above and close to the metal container.

MATERIAL FEEDERS

The material feeders consist of three lines with each line having three stations. The ductsused to ventilate these stations are located approximately 2 ft. from the opening of the feeders with each having a 90° entry. The ducts are 4", 5", and 6" in diameter, depending on the location to the main duct. Face velocities across each station ranged from 0-15 fpm. A fan located in the area contributed to the turbulence and redispersion of dust in the work atmosphere at the feeder stations. There were openings on the feeder stations that allowed the operator to see into the feeder. Although they were equipped with plexiglass they were left open. This also contributed to the dust buildup in the area. The scrap grinder and the feeder stations are on the same collection system. This collecting system, consisting of three units of canvas bags with 16 bags in each unit, is located inside the plant. These bags are cleaned by mechanical shaking with the asbestos falling into 55 gallon drums located beneath the bags. There is a large opening between the bags and the drums and when the bags are shaken a large portion of the dust is released to the work area. The spillage, like the spillage from the scrap grinder and the feeders, is swept up by using a push broom. Although the plant has a vacuum cleaner it was not used in these areas.

BLOCK SAW OPERATION

The exhaust on this operation was in the best condition of any in terms of removing the dust at the source. However, the blower assembly and the collector bags had holes in them and the dust exhausted from the operation was released into the work area.

LARGE SAW OPERATION

In this operation the larger sections of pipe insulation are trimmed. The pipe is put on a conveyor and both sides are trimmed simultaneously using a band saw. At the base on each side of the saw there is a 6" duct to exhaust the dust. The face velocity at these ducts was measured at 200 fpm. This does a good job at the bottom but the dust generated at the top of the cut is released to the work area. When the ends are trimmed, the pipe then goes to a splitter which makes a cut along the length of the pipe. For exhausting the dust from this operation there is a side draft or suspended hood arrangement. It does a good job of exhausting the dust around the outside and along the cut, but the dust is not removed from the inside of the pipe. When it is removed it is inverted and the dust is released to the work area. There is a considerable amount of dust in this part of the operation. This was the only operation in which the dust collector was located on the outside of the building.

RESPIRATORS

In 1971, the wearing of respirators was made mandatory in all areas of the plant. Respirators used in the plant were MSA Comfo Mask with BM21B-90 filters. Although they have a definite application, respirators should not be worn as a regular means of protection. Respirators should be used only as an emergency or for backup protection. This does not seem to be the intent at this plant. Unless properly fitted, correctly used, and properly maintained, a respirator may become a hazard because it gives the wearer a false sense of security and permits him to become careless and may add to his exposure. If respirators must be used they should be controlled through a company operated program providing for proper selection, fitting, maintenance and cleaning. This part of the program is lacking since many workers were seen with straps too loose, and straps not connected. There is no maintenance and standardization program for the respirators.

HEALTH HAZARDS

In addition to the health hazard from the amosite asbestos, the following potential hazards were noted:

1. The lunch room is located too close (approximately 40-50 ft.) to the dustiest operation in the plant.

2. Workers are allowed to go into the lunch room wearing clothes contaminated with asbestos.

3. There is a potential health hazard from the diatomaceous earth handling operation.

4. The scrap material that is dumped into the open field may cause a serious community health problem.

5. The sand, used on the floor to enable cartons to be moved more easily, may present a silica dust problem.

ADDITIONAL COMMENTS

Some additional potential hazards were observed as follows:

1. There are 6 homemade natural gas heaters located throughout the plant. Since they are vented into the plant this may cause carbon monoxide or fire and explosion hazard.

2. Compressed air outlets operating at 90 psi are located throughout the plant for the purpose of blowing excess dust off employees. This is not only a hazard to the employees but it reintroduces the asbestos dust to the working environment.

MEDICAL PROGRAM

The company has no in-plant medical facilities or first aid room. Two first aid cabinets were stocked inadequately, and one first aid cabinet had a door with broken glass.

Occupational health consultation is available from corporate headquarters in Pittsburgh, Pennsylvania. Dr. Lee Grant, Medical Director of PPG Industries, Inc., is Medical Consultant to the Pittsburgh-Corning Corporation.

Employees are sent to the Tyler Medical and Surgical Clinic for X-rays, physical examinations, and emergency care. Pulmonary function and X-rays were performed on all male employees in August 1971, at the nearby East Texas Chest Hospital by Dr. George Hurst, an internist and specialist in chest diseases.

Diffusion studies and arterial blood gases were obtained on those male employees with greater than 5 years employment. At the present time the workers do not receive pre-employment X-rays due to the high turnover of new personnel; however, after 60 days employment chest X-rays are taken.

In August 1971, U.S. Bureau of Mines approved respirators were made mandatory throughout the plant concomitant with an application to the Occupational Safety and Health Administration, U.S. Department of Labor, for variance from the asbestos standard. In the finishing and batching area of production (feeders and scrap grinders), the use of respirators has been mandatory since 1965. Safety glasses are required. No protective clothing is issued to employees, and there are 5 air hoses operating at 90 lbs/sq. in. and located throughout the plant to blow off excessive dust.

Also, the variance request sets forth the requirement: "Continuing health education program on asbestos will be provided." However, during the present survey, many employees apparently were unaware of the serious implications of asbestos exposure.

MEDICAL DATA AND RECOMMENDATIONS

Asbestos is a general name given to a variety of fibrous minerals. The major asbestos minerals are chrysotile, crocidolite, amosite, and anthrophylite. Amosite is used exclusively at this plant in the production of thermal pipe insulation.

Asbestos-related diseases have been well documented in the medical and occupational health literature. The risk of developing asbestosis or pulmonary fibrosis varies directly with length of exposure and concentration of exposure. The association between occupational exposure to asbestos and lung cancer, pleural mesothelioma, and peritonial mesothelioma is recognized.

NIOSH industrial hygiene surveys in 1967 and 1970 yielded grossly excessive fiber concentrations compared to current and proposed standards. Again, the present survey yielded grossly excessive fiber concentrations in all production, finishing, and shipping areas.

NIOSH medical questionnaires and examinations for rales and finger clubbing were conducted by our survey team on 63 male employees in order to complement the X-rays and pulmonary function tests performed by Dr. George Hurst of the East Texas Chest Hospital in August 1971, at the request of the Pittsburgh-Corning Corporation. Several films were read as possible pulmonary fibrosis. Dr. Lee Grant, Medical Consultant to Pittsburgh-Corning Corporation, has delayed release of these films to NIOSH and its expert panel of radiologists pending his personal review of the X-rays. Even without benefit of X-rays, 7 of 18 workers with 10 or more years employment at the Tyler plant meet at least 3 of 4 criteria for asbestosis. These criteria include:

1. Forced vital capacity below 80% of predicted.
2. Dyspnea.
3. Finger clubbing.
4. Rales.

Positive X-rays could increase further the number of cases of asbestosis. Reduced pulmonary function was also observed in a few workers with less than five years employment.

In conclusion, the following medical recommendations are set forth:

1. Chest X-rays obtained in August 1971, should be forwarded to NIOSH and its expert panel of radiologists for the benefit of the Tyler employees.
2. Reduction of asbestos exposure levels to conform to existing standards is imperative in order to prevent any irreversible pulmonary damage.
3. Following a review of the X-rays, further and more specific medical recommendations will be made.
4. Medical follow-up of present and past employees is indicated. Certainly asbestosis has been reported to progress following cessation of asbestos exposure.

DISCUSSION AND CONCLUSIONS

Inhalation of asbestos dust has long been recognized as a serious occupational health hazard. Asbestos-related health effects were detected in many Tyler employees.

This plant has been in operation since 1954. NIOSH surveys in 1967 and 1970 yielded excessive fiber concentrations, and again, this survey yielded fiber concentrations grossly in excess of current and proposed standards.

Housekeeping practices and the ventilation system were inadequate. According to the AIHA Industrial Ventilation Manual, a minimum capture velocity of 200 fpm at the face of the material feeders and a duct velocity of 3500 to 4500 fpm should be maintained. Since the open area of the material feeders is approximately 9 sq.ft., the minimum effective air movement would be 8 ft. x 200 fpm = 1600 cfm. The carrying velocity in the main duct should be approximately 3100 cfm. The present system does not meet these criteria.

The respirator program is inadequate and does not offer sufficient protection.

In conclusion, immediate measures should be taken to insure the employees a safe and health work environment. Further asbestos exposure could result in irreversible pulmonary damage. Immediate corrective action is mandatory and the following industrial hygiene recommendations are set forth:

1. A complete redesign of the ventilation system.
2. Locate all dust collectors on outside building and equip collectors with automatic shakers.
3. Appoint a safety committee to educate employees to hazards of asbestos.
4. Remove all homemade gas heaters from the plant.

5. Do not allow employees to use compressed air to remove dust from clothes.

6. Establish a company operated and controlled respirator program providing for proper selection, fitting, maintenance and cleaning.

7. The lunch room should be located in a clean area of the plant and employees should not be allowed to enter with dirty clothing.

8. All employees should be issued protective clothing such as coveralls and cotton caps and these clothes should be removed before eating and before going home.

9. All scrap materials should be buried.

10. Used asbestos bags should be buried also and not sold to nurseries or removed to the local dump.

11. Do not use sand on floor to transport cartons.

REPORT PREPARED BY:

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William Johnson, M.D.

REFERENCES

1. Documentation of Threshold Limit Values, American Conference of Governmental Industrial Hygienists, Committee on Threshold Limit Values, Cincinnati, Ohio 1971.

2. Threshold Limit Values of Airborne Contaminants and Physical Agents, American Conference of Governmental Industrial Hygienists (1971).

3. Industrial Ventilation - A Method of Recommended Practice. 11th ed.

TABLE I

ANALYSIS OF PERSONAL SAMPLES

PITTSBURGH-CORNING ASBESTOS PLANT, TYLER, TEXAS

ASBESTOS PIPE-INSULATORS

| OPERATION | | SAMPLE | CONC. (FIBERS >5μ/ml) |
|---|---|---|---|
| Mixing | | | |
| | Feeder | 45 | 54.04 |
| | Feeder | 139 | 105.83 |
| | Feeder | 117* | 101.71 |
| | Feeder | 99* | 169.7 |
| | Scrap Feeder | 106 | 9.58 |
| | Feeder | 60* | 188.91 |
| | Feeder | 12* | 92.77 |
| | Feeder | 57 | 26.4 |
| | Feeder | 82 | 9.14 |
| | Feeder | 132 | 22.5 |
| | Feeder | 29 | 37.6 |
| | Maximum Concentration | | 189 |
| | Average Concentration | | 75 |
| Forming | | | |
| | Builder | 18 | 40.93 |
| | Builder | 91 | 26.11 |
| | Builder | 103 | 14.61 |
| | Builder | 88 | 7.45 |
| | Builder | 119 | 9.42 |
| | Builder | 83 | 25.79 |
| | Builder | 85 | 42.77 |
| | Relief Builder | 105 | 22.33 |
| | Builder | 89 | 6.67 |
| | Builder | 121 | 25.53 |
| | Builder | 54 | 12.28 |
| | Builder | 25 | 57.72 |
| | Relief Builder | 71 | 35.24 |
| | Builder | 90 | 17. |
| | Builder | 92 | 37.54 |
| | Builder | 120* | 90.9 |
| | Builder | 110 | 70.36 |
| | Builder | 107* | 103.97 |
| | Relief Builder | 111 | 30.43 |
| | Builder | 16* | 134.41 |
| | Builder | 20 | 53.23 |
| | Builder | 14 | 44.31 |
| | Builder | 17 | 59.58 |
| | Builder | 53 | 42.99 |

Forming

| | | |
|---|---|---|
| Maximum Concentration | | 134 |
| Average Concentration | | 42 |
| Relief Builder | 27 | 72.12 |
| Builder | 74 | 9.74 |
| Builder | 15 | 64.35 |
| Builder | 24* | 111.15 |
| Builder | 131 | 13.8 |
| Builder | 136 | 9.9 |
| Builder | 122 | 14.8 |
| Builder | 101 | 26.9 |
| Builder | 124 | 8.44 |
| Builder | 65 | 56.45 |
| Builder | 95 | 36.41 |
| Builder | 58 | 14.75 |
| Relief Builder | 56 | 24.27 |
| Builder | 102 | 31.2 |
| Labor | 52 | 11.26 |
| Maximum Concentration | | 134 |
| Average Concentration | | 36 |

Curing

| | | |
|---|---|---|
| Oven Tender | 47 | 23.5 |
| Oven Tender | 140 | 5.08 |
| Oven Tender | 112 | 6.89 |
| Oven Tender | 93 | 19.87 |
| Oven Tender | 84 | 16.40 |
| Maximum Concentration | | 29 |
| Average Concentration | | 14 |

Finishing

| | | |
|---|---|---|
| Supervisor | 68 | 20.38 |
| Wrapper | 130 | 11.43 |
| Wrapper | 98 | 37.45 |
| Finishing Laborer | 1 | 30.43 |
| Utility-Finishing | 3 | 48.53 |
| Utility-Finishing | 66 | 12.03 |
| Wrapper | 8 | 94.81 |
| Utility-Finishing | 4 | 55.11 |
| Finishing Laborer | 22 | 22.83 |
| Saw Operator | 30 | 27.36 |
| Saw Operator | 126 | 19.38 |
| Saw Helper | 78 | 14.18 |
| Saw Operator | 76 | 31.23 |
| Saw Operator | 94 | 21.9 |
| SRL Saw | 118 | 1.73 |
| Cutting Saw | 51 | 91.76 |

| | | |
|---|---|---|
| **Finishing** | | |
| SRL Cutting Saw | 55 | 40.28 |
| Saw Feeder | 35 | 2.30 |
| Pine Machine Oper. | 006* | 208.42 |
| Saw Labor | 007 | 97.26 |
| Saw Labor | 116 | 6.59 |
| SRL Saw | 134 | 25.97 |
| SRL Saw | 141 | 1.96 |
| Saw Labor | 109 | 11.62 |
| SRL Labor | 26 | 91.52 |
| Maximum Concentration | | 208 |
| Average Concentration | | 41 |
| **Inspection** | | |
| Box Marker | 86 | 20.71 |
| Weigher | 59 | 34.49 |
| Fork Lift Operator | 2 | 11.71 |
| Packer | 21 | 9.5 |
| Packer | 42 | 1.84 |
| Shipping Supervisor | 43 | 2.18 |
| Packer | 10 | 13.08 |
| Fork Lift Operator | 62 | 20.42 |
| Labeler | 63 | 20.72 |
| Inspector | 69 | 92.26 |
| Weigher | 5 | 29.45 |
| Inspector | 23 | 73.62 |
| Packer | 9 | 3.83 |
| Packer | 44 | .71 |
| Weigher | 125 | 6.8 |
| Maximum Concentration | | 92 |
| Average Concentration | | 23 |
| **Miscellaneous** | | |
| Maintenance | 75 | 32.08 |
| Utility | 135 | 2.09 |
| Utility | 133 | 8.36 |
| Maintenance | 108 | 18.12 |
| Utility | 39 | 30.38 |
| Maintenance | 11 | 42.28 |
| Maintenance | 13 | 26.81 |
| Maintenance | 50 | 28.43 |
| Maintenance | 64 | 37.54 |
| Sweeper | 97 | 3.61 |
| Maintenance | 123 | 2.10 |
| Maintenance | 127 | 0.94 |
| Janitor | 129 | 2.29 |
| Shipping | 40 | 1.36 |
| Guard | 73 | 1.94 |

| | | |
|---|---|---|
| **Miscellaneous** | | |
| Guard | 113 | 4.58 |
| Guard | 72 | 0.64 |
| Supervisor | 128 | 1.57 |
| Supervisor | 080 | 14.92 |
| Supervisor | 19 | 29.91 |
| Supervisor | 79 | 6.28 |
| Supervisor | 77 | 24.25 |
| Supervisor | 104 | 25.2 |
| Supervisor | 115 | 2.28 |
| Maximum Concentration | | 42 |
| Average Concentration | | 14 |
| **Office Workers** | | |
| | 154 | 0.04 |
| | 152 | 0.04 |
| | 158 | 0.03 |
| | 155 | 0.66 |
| Maximum Concentration | | .66 |
| Average Concentration | | .22 |

* = Approximate (too many to count)

Samples taken on October 26, 27, 28, 29, 1971

## ASPHALT-ASBESTOS PRODUCT OPERATION CODES

600 Mixing - dry
- Mixer - dry
- Blender
- Hopper Man
- Slate Controller
- Hopper Car Unloader

610 Mixing - wet
- Mixer - wet
- Canner
- Barrel Filler

620 Forming and Coating
- Coater
- Saturator
- Dipper
- Extruder
- Shingle Machine Tender
- Still Cleaner
- Still House Fireman

630 Finishing
- Cutter Operator
- Rewinder Operator
- Press Operator

640 Inspection and Packing
- Packer
- Pallet Tier
- Wrapper
- Inspector
- Fork Lift Operator (packing)

650 Miscellaneous - Asphalt Product
- Sweeper
- Mechanic
- Lubricator

# ASBESTOS INSULATION

700 MIXING
- 6-51.945 Mixer
- 9-88.400 Scrap Grinder
- 9-69.010 Stone Dust Operator
- 6-51.995 Feeder

710 FORMING
- 6-70.510 Builder
- 6-70.515 Press Operator

720 CURING
- 7-10.245 Oven Tender

730 FINISHING
- 6-78.611 Band Saw Operator
- 6-78.611 Nob Catcher
- 9-68.305 Wrapper
- 6-27.043 Canvas Cutter
- 9-88.401 Material Handler

740 INSPECTION & PACKING
- 9-68.300 Packer
- 9-68.310 Inspector
- 9-68.200 Labeler
- 6-42.340 Box Marker
- 9-88.420 Forklift Operator
- 9-68.200 Weigher

750 MISCELLANEOUS
- 2-86.202 Sweeper
- 2-86.202 Janitor
- 5-83.641 Machine Maintenance Man
- 1-36.010 Production Clerk
- 5-92.292 Foreman
- 5-83.621 Utility Operator
- 9-88.405 Waste Collector
- 5-78.100 Millright
- 0-50.221 Lab Technician

751 OFFICE WORKER (Occupational history only)

760 FOAMGLASS INSULATION

770 POLYURETHANE INSULATION

780 FOAMBLOCK INSULATION