THE TRAVELERS

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CASUALTY-PROPERTY DEPARTMENT
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March 9, 1973

RIV 72 PT 03

CERTAIN-TEED PRODUCTS CORPORATION
P. O. Box 706
2100 Avalon Boulevard
Riverside, California 92509

Attn: Roy W. Wingartner
Plant Manager

Re: Survey for Airborne
Asbestos and Particulates

Dear Mr. Wingartner:

The purpose of this letter is to forward the attached Engineering Report. Should you have any questions regarding the report, please continue to feel free to contact this office.

Very truly yours,

THE TRAVELERS INSURANCE COMPANY

R. C. Orpin

R. C. Orpin
Engineering Representative

RCO:yd

Travelers - Trial Exhibit
11/17/93

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SURVEY FOR AIRBORNE ASBESTOS AND PARTICULATES

CERTAIN-TEED PRODUCTS CORP.
2100 Avalon Street
Riverside, California 91057

Prepared by

ROBERT J. JEFFERYS
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CHEMICAL, ENVIRONMENTAL AND PRODUCTS SERVICES UNIT

2 March 1973

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I. INTRODUCTION

On 13 and 14 November 1972, Engineering Representative R. C. Orpin, of the Travelers' Los Angeles Engineering office, and the writer, conducted a series of Industrial Hygiene Surveys at your Riverside, California, Cement-Asbestos Pipe Plant. A principal purpose of this survey was to evaluate the effects of atmospheric contaminants in the area, and to conduct a follow-up to a similar, less comprehensive, survey done in February 1972. A Sound Level survey was also conducted at the same time.

This report will present the results of the survey for airborne asbestos, and particulates, an evaluation of the results, and such Conclusions and Recommendations as were developed as a result of this survey.

II. SUMMARY

A survey for asbestos and silaceous particulates as airborne contaminants was conducted. All 27 samples for asbestos showed levels below 5.8% of the present TLV (Threshold Limit Value) and still below 14.5% of the new, lower, TLV to be effective 1 July 1976. Comparison with results of previous tests in February 1972 are confirming.

Tests for particulates, most of which contained discernable quantities of free silica, showed 37% over the TLV, only 26% below what is considered a really acceptable level of 50% of TLV, with the balance, 37%, in a precautionary area between 50% and 100% of TLV. The problem lies with the mixer man who apparently encounters silaceous dusts in his activities other than actual asbestos dumping, some problem even around the pipe machine and many operations in the "Finishing Department" which are precautionary or danger operations. Some areas and operations were not checked, either because exposure was subjectively evaluated not to exist, or because the equipment was not in operation during the survey period.

Subjective evaluation of the existing local exhaust ventilation system, combined with the almost uniformly high results of the survey, indicate that the system is not adequately designed to handle the exposure, and also needs to be extended to cover all equipment in the Finishing Department. Personal respiratory protective equipment is used at some work stations, but not all where exposure exists. There is no posting of where such equipment must be worn.

II. SUMMARY (Continued)

There is a medical program, but it is in need of improvement to better assure control of the exposure.

Recommendations are entered to 1) extend the respirator program to all exposed areas, until such are corrected by engineering means and reevaluated, 2) Evaluate, redesign and extend the local exhaust ventilation system to adequately control the exposure, 3) Reinforce the medical programs; 4) Post areas requiring respirators; 5) check activities of the miner man to better evaluate exposure, and 6), keep local exhaust ventilation and vacuum cleaning systems separate.

III. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

1. The general levels of atmospheric contamination by asbestos fibres over 5 micron in length, were all significantly low. Levels were all below 5.8% of the current 5 fibre/ml TLV, and not over 14.5% of the 1976 TLV of 2 fibres/ml. Comparison with previous results are confirming.

2. There is a potentially severe silicosis exposure throughout the plant. Out of 27 samples, 37% are in excess of the TLV, 7% are between 80% and 100% of TLV, 30% are between 50% and 80% of TLV, and only 26% are less than 50% of TLV. Considering the nature of the operation, only 26% of results are deemed to be within acceptable limits.

3. The local exhaust ventilation system does not appear to be satisfactorily designed to control the special exposure of silicosis. A need for complete evaluation of the system to good design practice is needed, and such parts of the system as are not adequate should be revised or replaced. The system should be extended to all machines in the "Finishing" side of the plant.

4. There is a reasonably effective respirator use program, however, based on the results observed, it is ineffective in controlling the exposure. This is because all exposure areas were not necessarily recognized, and not because of negligence on the part of Certain-Teed.

B. Recommendations

1. IMPORTANT (Revised and resubmitted from recommendation Number 2 in Report issued under date of 16 March 1972). Recommend that all employees working in the asbestos warehouse, near the asbestos dumping station wherever sandy dusts are handled, and at all machine operating positions in the Finishing Department, be issued and required to wear, subject to administrative corrective action for failure to do so, a Bureau of Mines approved respirator for use where free silica and asbestos are present. This use should be continued until corrective changes can be made in the local exhaust ventilation system, and the silica bearing particulate levels can be reduced to at least below 50% of the TLV, as verified by a series of random samples gathered over a representative period of time. Where corrective action is ineffective in correcting the exposure, continued use of respirators should be required.

2. IMPORTANT Recommend that the local exhaust ventilation system in the plant be evaluated for adequacy of design principles as provided in the publication "Industrial Ventilation", A Manual of Recommended Practice, or other equal reference should be used as standard for evaluating the existing system. Where hood designs, air quantities, duct velocities, etc. are not found satisfactory, appropriate corrective action should be taken. This system should also be extended to all machines in the "Finishing Department".

B. Recommendations (Continued)

3. IMPORTANT Recommend that a firm policy on medical control of employee exposure to asbestosis and silicosis be established. The present pre-employment physical, with chest x-Ray should be continued. Emphasis should be placed in this x-Ray in evaluating it for any previous asbestosis or silicosis exposure and lung damage. This physical, with oriented chest x-Ray, should be repeated at least annually on all employees. Additional tests, such as vital function, or other than can help test and evaluate lung impairment due to silicosis or asbestosis, would also be considered desirable.

4. Recommend that all areas and machines where respitory protective equipment is required to be worn, be posted at each means of ingress, at each machine, and with such internal area postings as appropriate, to the effect that "Respitory Protective Equipment must be worn in this area", or " - - - While Using this Machine".

5. Recommend that the area of activity of the "mixer Man", other than at the actual asbestos dumping station, be evaluated to discover where he may be encountering particular airborne contamination of silaceous respirable dusts, and that such operator be required to wear his respirator in such areas.

6. Recommend that systems for providing local Exhaust Ventilation on equipment where particulate exposure exists, and systems to be used for cleaning up the work area and machines (Vacuum Cleaning Systems) be maintained as independent systems, specifically designed for the intended use.

IV. DISCUSSION

A. Operations and Process

The manufacture of cement asbestos pipe involves the mixing of raw materials, forming, curing, machining and testing of the product.

Raw materials consist primarily of various grades of asbestos, received in bales. These are dumped at a special station and conveyed over head for processing. This is then combined with cement and sand, received in bulk, in automated machinery, and mixed to a water slurry. The slurry is then formed onto a mandral to make pipe or coupling stock to specific diametrical dimensions. This is then released from the mandral after a preliminary curing, and the mandrel removed.

The product is then steam cured in autoclaves. It is next machined to length and to end configuration on the pipe, pressure tested and a coupling installed. Coupling stock is sliced to length, internally machined and prepared for application. Some pipe, with defects in part, is salvaged by cutting and machining to shorter lengths. Fittings are machined and hand assembled, other special fittings and components are special machined.

B. Threshold Limit Values (TLV's)

The Occupational Safety and Health Act regulations, as promulgated in the Federal Register for Wednesday, 18 October 1972, Volume 37, Number 202, Part II, in Section 1910.93a, page 22142, provides for a maximum Permissible exposure to airborne concentrations of asbestos not to exceed five (5) fibres longer than five (5) micrometers (microns), per cubic centimeter of air on an 8 hour time weighted average basis, as determined by the membrane filter method at 400-450 magnification with phase contrast illumination. Effective 1 July 1976, this Limit is reduced to two (2) fibres per cubic centimeter. A ceiling value of 10 fibres per cubic centimeter is also prescribed.

B. Threshold Limit Values (TLV's) (Continued)

The same document prescribes for quartz dust (dust containing free silica), the following Limits (see page 22142):

$$\text{Quartz (respirable)} = \frac{10\ mg/M^3}{\%\ SiO_2 + 2}$$

$$\text{Quartz (as a General Dust)} = \frac{30\ mg/M^3}{\%\ SiO_2 + 2}$$

The American Conference of Governmental Industrial Hygienists (ACGIH) also publishes TLV's. The latest published values are in the document "Threshold Limit Values for substances in Workrooms air Adopted by ACGIH for 1972". This document gives a more restrictive formula for calculating quartz as a general Dust, as follows:

$$\text{Quartz (as a general Dust)} = \frac{30\ mg/M^3}{\%\ SiO_2 + 3}$$

It is this more restrictive formula which the Travelers uses, and which will be considered in the remainder of this report.

C. Results of Survey

Table IV-1 analyzes the results presented in Table V-1, in a form to reflect the process flow through the plant, and also to present the results of samples from the same or similar areas together. Also, the TLV's for the personnel samples (numbers 931. 951. 779, 939 and 926) have been re-calculated to the respirable formula given in section B above. Note that for General Area and breathing zone samples the more restrictive ACGIH formula was employed.

TABLE IV-1

ASBESTOS AND SILICA ATMOSPHERIC CONTAMINATION LEVELS

SAMPLE LOCATION	SAMPLE NUMBER	TYPE (a) OF SAMPLE	NUMBER OF ASBESTOS FIBRES FOUND OVER 5μ (TLV[b])	DUST (QUARTZ) CONCENTRATIONS		
				TOTAL PARTICULATES	QUARTZ	TLV (c)
			Fibres/ml	mg/M^3	%	mg/M^3
Asbestos Dump Station						
Mixer man	931	P	0.29	0.95	14.5	0.61
Dump Station	936	GA	0.06	0.32	53.0	0.54
Mixer man	951	P	0.09	0.50	19.1	0.47
Pipe Machine						
Operator Station	909	BZ	0.04	0.23	73.5	0.39
Mandrel Man	908	BZ	0.02	2.1	8.0	2.73
Lathe #1						
Operator Station	933	BZ	0.04	0.74	39.3	0.71
Lathe #2						
Operator End	911	BZ	0.08	0.66	10.1	2.29
Operator End	773	BZ	0.05	1.6	13.1	1.86
Operator,	779	P	0.03	0.94	23.1	0.40
Asst.Operator end	920	BZ	0.13	1.9	7.4	2.88
Asst.Operator end	935	BZ	ND	1.50	ND	10
Package end of Line	673	GA	0.10	0.80	ND	10
Boring Mills						
#1 Mill	937	BZ	0.05	1.1	7.8	2.77
#1 Mill	916	BZ	0.03	1.01	ND	10
#2 Mill	918	BZ	0.11	2.7	10.6	2.21
#2 Mill	923	BZ	0.06	0.95	18.4	1.40

TABLE IV-1

ASBESTOS AND SILICA ATMOSPHERIC CONTAMINATION LEVELS

(Continued)

SAMPLE LOCATION	SAMPLE NUMBER	TYPE (a) OF SAMPLE	NUMBER OF ASBESTOS FIBRES FOUND OVER 5μ (TLV[b])	DUST (QUARTZ) CONCENTRATIONS		
				TOTAL PARTICULATES	QUARTZ	TLV (c)
			Fibres/ml	mg/M^3	%	mg/M^3
Cut-Off Saw						
Saw Operator	939	P	0.02	0.30	23.5	0.39
At Saw	928	BZ	0.18	1.98	21.6	1.22
At Saw	745	BZ	0.07	0.06	ND	10
Coupling Cut-off						
At Machine	798	BZ	0.06	2.60	7.1	2.97
At Machine	661	BZ	0.22	4.3	8.7	2.56
F-M Lathe						
At Lathe	940	BZ	0.06	0.64	22.6	1.17
Lathe Operator	926	P	0.11	0.87	23.6	0.39
At Lathe	560	BZ	ND	4.4	0.8	7.89
Fitting Area						
#2 Core Drill	907	BZ	0.20	3.9	10.2	2.27
Assembly Bench	929	BZ	0.11	0.53	ND	10
Coupling Wet Tester	913	GA	0.21	2.2	17.4	1.47

ND - None detected

a - GA - General Area
BZ - Breathing Zone
P - Personal

b - TLV is 5 Fibres/ml currently, reducing to 2 Fibres/ml on 1 July 1976

- Calculated to the more restrictive ACGIH Formula

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D. Evaluation of Results

1. Asbestos Levels

All asbestos samples showed values at or below 0.29 fibres/ml, with the current TLV being 5 fibres/ml dropping to 2 fibres/ml on 1 July 1976. Therefore all samples are less than 5.8% of the current TLV and still not over 14.5% of the 1976 TLV. The average concentration is 0.09 fibres/ml, and the median value is 0.07 fibres/ml. No probelm area with asbestos appears to exist, or are the concentrations found even close to any existing or proposed TLV.

2. Silica Particulates

a. Asbestos Dump Station

Both of the respirable type of personal samples, taken on the man who dumps asbestos, showed quartz bearing particulate levels in excess of the TLV's. One (1) sample was 56% over the TLV, the other 6% over the TLV. Since these samples were actually taken on the man, where he went and what he did when away from the dump station, they reflect a more true evaluation of the exposure than does the general area sample taken at this station, which was only at 60% of the TLV. We did not follow this particular operator around, so it can only be conjectured, but it appears that part of his duties take him into areas not reflected in the general area sample. This should be more thoroughly evaluated by Certain-Teed.

The dumping station is equipped with local exhaust ventilation. The operator also wears a respirator. A Bureau of Mines approved respirator for both the asbestos and silicosis hazard, should provide adequate protection to the worker. Not determined at the time of survey was if this operator wears this respirator during the course of other duties away from the asbestos dumping station. If he does not, then a silicosis exposure would appear to exist.

The respirator used is a Wilson 1210 with an R10 cartridge.

D. Evaluation of Results (continued)

2. Silica Particulates (continued)

b. Pipe Machine

Both samples taken near the pipe machine were below the TLV, however, with the operator side at 59% and the "Mandrel Man" side at 77% of TLV, we are in a precautionary area where the "yellow flag" is up. The particular concern would be the "mandrel man" side of the machine, where a 50% increase in free silica content would drop the TLV to the actual particulate level found. Investigation in this area to assure control would appear in order. There are no particular ventilation controls in this area, and the workers do not wear respitory protective equipment.

c. Pipe Lathes

Only two (2) lathes could be evaluated, and the exposure can vary greatly with size and wall thickness of pipe being machined. On Lathe #2, the one (1) personal sample taken on the operator showed respirable dust levels 135% above the TLV (235% of the TLV). This was particularly occasioned by the high percentage of free silica in this sample indicating that the respirable particles are also the ones containing the most free silica. The other samples range from 15 to 86% of TLV on Lathe #2, and at 104% of TLV on the single sample on Lathe #1. These values therefore indicate problem areas at the Lathes.

There is local exhaust ventilation at the cutting part of the lathe. The operators wear no respiratory protective equipment.

2. Silica Particulates (continued)

c. Pipe Lathes (Continued)

The material being run during samples 911 and 920 was 15" AC 35 pipe, that during the other samples was 10" FT 35. Not noted was the material on Lathe Line #1, however, the sample was taken at 12:40 PM on 14 November 1972.

The packaging end of the line indicates no area of problem with silica dust.

d. Boring Mills

The four (4) samples on the two (2) mills indicate three (3) of four (4) samples are within limits (10 to 68% of TLV,) with one (1) sample at 122% of the TLV. Distinguishing between the mills, #1 Mill was at 10% and 40% of TLV, #2 Mill samples were at 68% and 122% of TLV.

These mills do operate on different sizes and qualities of stock, which in turn can materially affect the dust production. There would be indications, however, that the local exhaust ventilation on #2 Mill was somewhat less effective than on #1 Mill. Both mills were machining on 8" 150 lb. couplings during all tests run.

e. Cut-off Saws

Three (3) samples were taken. Numbers 939 (a personal) and 928 (a breathing zone) were taken on the same day and about the same time. These show, on the personal sample, the respirable particulate load at 77% of the TLV, and the area sample at 162% of the TLV. It would therefore appear that a definite problem exists. During this sampling, the operator was running miscellaneous sizes and cuts, but mostly in smaller sizes, up to about 8".

e. Cut-off Saws (Continued)

The third sample (745) was run the following day, while running a uniform cutting program on 10" FT 35 pipe. This sample not only indicates a very low particulate value (0.06 mg/M^3) but no free silica and hence a maximum TLV at 10 mg/M^3.

It was observed by the writer, and also indicated by supervision, that on this particular operation, the larger the pipe the better the control over dust. This is apparently because a lot of dust is internal in the pipe, and the local exhaust ventilation is not able to probe to the dust source and capture the dust as well with smaller pipe as with larger pipe.

There is local exhaust ventilation on this equipment, however, because of the configuration and constant variation in the operation, and its "custom" nature, it is not as effective as would be desirable. The operator does wear the Wilson 1210-R10 Respirator.

f. Coupling Cut-off Machine

Two (2) Breathing Zone samples show high particulate levels. One (1) reading is at 88% of the TLV, the other at 168% of the TLV (68% over). Particular in interest is the fact that the free silica levels in both were rather low and confirming of one another, and that the close to and over TLV levels were occasioned by high particulate counts, comparatively speaking.

The two (2) samples were taken on successive days, and on both days stock for 8" - 150 lb. couplings was being sliced. Local exhaust ventilation is provided and the operator has a Wilson 1210-R10 respirator.

g. F-M Lathe

Three (3) samples were run. The first (#940) was on the first day as a breathing zone sample. Machining was being done on 24" pipe. This sample showed particulate levels at 55% of the TLV.

The other samples, a personal and a breathing zone, were taken the second day. 8" nipples were being machined. These showed levels of 224% and 56% of the TLV respectively. While it is difficult to project on the limited sampling, the fact that the breathing zone samples compare favorably, and that the personal sample is so high, indicates that there is characteristics on the lathe that generate free silica particles predominately in the respirable fraction.

h. Fittings Area

Only one (1) machine was being used in this area during the survey, this being the #2 core drill. Results show total particulates at 172% of the TLV (72% over TLV). Also of note is the fact that as particulates go in all samples, the amount found in this area was to the high side.

On the fittings assembly bench, the overall particulates level was low, and with no detectable free silica in the sample, was well within the TLV. This information should be regarded with cautious optimism, however, as it could just be a matter of particular circumstances, when considering the other samples in the area are both quite high.

The other sample was at the coupling wet tests, where the particulates were found to be at 150% of TLV (50% over the TLV).

h. Fittings Area (Continued)

There is no local exhaust ventilation in this area, and none of the personnel wear respitory protective equipment. Most of the work is carried out in a wet state, and hence the results are even more disturbing when thinking what results would be found if the area and work were not generally wet.

i. Overall

Out of 27 samples, 10 or 37%, are over the TLV, another two (2), or 7% are between 80% and 100% of TLV, and eight (8) more, or 30%, are between 50% and 80% of TLV. Only seven (7) samples, or 26%, fall below 50% of TLV. At the point of five (5) of the ten (10) samples over the TLV, no respitory protective equipment is used, and at two (2) there is question of its use in the actual exposure area (mixer man on asbestos dumping). There are only three (3) where respirators are worn.

Generally speaking, and considering the nature of the operation, particulate levels in excess of 50% of TLV must be considered suspect, and should be treated with caution. There can be sufficient variation in the sampling, in the operation, in the material being worked, that a 50% of TLV exposure could quickly become a 100% exposure. Only 26% of samples fall below this 50% criteria.

E. Areas and Machines Not Surveyed

1. General

Areas and machines not surveyed were for two (2) reasons. One was a judgement determination that no problem of significance would exist, which when combined with best use of available time and equipment, were by-passed. The other was that not all equipment or machinery is in use at all times, and hence no sampling could be made on some equipment.

2. Areas Judged of No Problem

a. Asbestos Warehouse

The principle exposure area appeared to be at the dumping station. This was sampled what was felt to be adequately. It is apparent that potential exposure areas exist in this end of the plant, to silica dusts, and that possibly a closer look into this area would have been warranted.

b. Mixing Area

The manufacturing or mixing side of the plant is generally well enclosed as to dusts, and most open exposures are in a damp or wet state. Also, the principle exposure areas were near the pipe machine in terms of employees. This was checked, is reported and is "yellow flagged". The rest of the area was by-passed.

c. Yard Area

While some dust, and free silica could certainly exist here, the general atmospheric conditions, combined with what would appear logically low levels any way, caused this area not to be checked.

d. Scrap Crushing Machine

This machine in the yard generates a good deal of dust, however, the operator is away from the actual machine and dust while the crushing is taking place, plus he is issued and supposed to wear a respirator (had it around his neck at the time). The area is also outside and hence less likely to be a problem. Meaningful sampling was therefore deemed not likely to be able to be made.

3. Machines Not Operating

a. Lathes

There are four (4) lathe lines, but only one (1) was significantly sampled, being the only one in operation except at the tail end of the second day. We are informed that only rarely is more than one (1) line in operation at any one time, never more than two (2) and that the operation shifts from machine to machine dependent on product being processed.

b. AF Boring Mill

This was not operated during the sampling period. We are informed that if it is working, either Boring Mill #1 or #2 would be down.

c. Cut-off Saw #2

This is identical to saw #1, and is a one or the other proposition with the same operator. The exposure which was actually sampled is therefore essentially the same.

d. Fitting Area

Only a limited sampling was possible since most of the machines in this area are used only infrequently. Most were not used during the sampling period.

e. Machine Shop

There was little or no activity in the shop during the survey period.

F. Comparison With Results of Previous Survey

1. General

The previous survey by the Travelers' was conducted on 23 February 1972. At that time five (5) samples were taken. Unfortunately, only asbestos fibre counts were reported, and no particulate counts or silica analysis. Some bulk samples were checked for free silica.

2. Asbestos

Asbestos counts were made previously at the mixing station, Lathe #3, Boring Mill #1, Cut-off saw and Coupling Cut-off. Results were all reported at less than 1 fibre/ml. The results were not as precisely reported as this time, but would indicate that results of the current series of tests are in all cases no worse and not likely really different than those previously reported.

3. Silica

Four (4) bulk samples were taken at Lathe #3, Boring Mill Number 1, Rework Cut-off Saw and Coupling Cut-off.

Comparing, on the lathe, (at the operators station) the previous bulk sample showed 5% free silica, whereas the three (3) current samples ran from 10.1% to 39.3%. At the Boring Mills, the previous value was given at 10%, whereas four (4) current samples ran from non detectable to 18.4%. The cut-off saw was previously reported as 1% free silica, the pair of samples this time were none detected and 21.6%. At Coupling Cut-off, 5% free silica was previously reported, with a pair of samples this time at 7.1% and 8.7%.

3. Silica (Continued)

It is difficult to draw definitive conclusions from this data as the more extensive number of samples taken on this series of tests showed very wide variations in free silica content. There is apparently a great deal of dependence on exactly what is being worked, machine speeds, etc. There is also an indication that the highest free silica levels are found in the finer dusts, which in turn tend to float away from the machines more. The previous bulk samples were all taken right at the machines proper, and hence were more likely to be lower in free silica.

C. Observations

1. Local Exhaust Ventilation System

Many of the pieces of equipment, especially in the finishing side of the facility, have local exhaust ventilation. Subjective observation, however, indicates that this system is not too well designed. This observation appears born out by the conditions found as respects silica particulates in many areas.

It is vitally important that local exhaust ventilation systems be very carefully designed, especially when encountering very potentially hazardous substances such as asbestos and free silica. What might prove adequate for general dust conditions could be totally inadequate for these special hazards.

It is for this reason that recommendation is being made to review and upgrade the local exhaust ventilation system throughout the plant, particularly in finishing, and adding presently unequipped equipment to the system.

The following points are but a few which should be considered in evaluating and designing such a system:

1) Very careful and accurate design and calculations are important. "Seat of the Pants" design will invariably prove deficient.

1. Local Exhaust Ventilation System (Continued)

2) Collecting hoods are critical and should be carefully designed and fitted.

3) Required air volumes should be carefully determined, as well as duct velocities in each part of the system. Duct work should then be carefully designed to accurately provide the velocities and reflect increases in volume as each branch duct is brought into the main ducts.

4) Provision for system balancing should be made.

5) Once in operation, care should be taken not to affect volumes and velocities by adding or subtracting branches, or by closing them off or opening them up as machines are put into or taken out of service. Once accurately designed, all openings should be left open at all times. If branches need be added or removed, accurate recalculation should be made to ascertain changes in system balance, and appropriate corrections made.

6) Local exhaust ventilation and vacuum cleaning should be separate entities, and should not be combined in the same system.

2. Use of Respirators

Respirators (Wilson 1210-R10) are issued to and required to be worn by the mixer man, the scrap crushing operator, and the saw operators and coupling cut-off operators. No respirators are required in manufacturing (Raw mix through curing). On the finishing side no other operators are required to wear such equipment than cited above. Respirators are required by personnel entering dust bag houses and into mixing equipment and under special circumstances.

3. Medical Program

There is a pre-employment program, including chest X-ray. We are told that this is not particularly directed to possible existance of asbestosis or silicosis. All employees have been re-X-Rayed within the last year, however, there is no firm program for periodic repeats. They are also running vital function tests on all employees.

H. Validity of Results

The results presented in this report represent samples taken and evaluated at one specific instance and at one particular time. While it was endeavored to take multiple samples, wherever possible, in the same or similar areas, it was not always possible to do so.

A valid Industrial Hygiene sampling program requires that a minimum of six (6), preferably as many as 10 samples be taken in a specific exposure area to firmly establish the true exposure. Such samples must be randomly taken as to shift of day, day of week, and week of year. Results reported here must therefore be taken in this context.

V. EXPERIMENTAL

A. Equipment

Airborne contaminant samples were taken using six (6) Permissible Air Sampling Pumps. Four (4) of these were manufactured by Bendix Environmental Science Division, and are Type C-115, Serial Numbers 254, 259, 324 and 373. These pumps bear Bureau of Mines approval 2G-2490. The other two (2) were Unico-Telmatic Model T-150A, Serial numbers 4447 and 4731.

Where personal samples were taken, the Bendix pump was supplemented with a Unico Environmental Instruments Catalogue 3600-90 two (2) stage Respirable Mass Lapel Sampler, with 37 mm filter element.

A. Equipment (Continued)

All samples were taken using Millipore Corporation 37 mm diameter 0.80 micron filter papers, mounted in plastic holders.

B. Procedure

Based on an evaluation of the process, locations and operations where workers could be exposed to asbestos or to silica dust were selected. Samples were taken at these locations. Most samples were taken in duplicate, or in such a way as to separately sample identical operations to provide confirming results.

Some samples were taken as personal samples. The Bendix pump and a mass lapel sampler were placed on the individual to be tested. These were sampled at nominal rates of 1.6 LPM (Liters per Minute), for 2 hours 45 minutes to 6 hours 38 minutes. Time variations were occasioned by practicality of sampling, with a 4 hour sample being the desirable objective.

Most of the rest of the samples were taken by placing the pump in a location which would best represent the breathing zone of the workers at a particular work station. These are Breathing Zone samples. A few General Area Samples, representative of an area, were also taken. These samples were all taken at nominal rates of 2.8 LPM (some variation occurred because of instrument characteristics) for nominal periods of 40 minutes minimum, with actual sampling periods ranging from 54 to 77 minutes (except #936 which was 226 minutes). Variations again were for reasons of practicability, with the objective being to sample a minimum of 100 liters of air.

C. Results

The results are given in Table IV-1, "Industrial Hygiene Analysis Report".

TABLE IV-A

ngineering
INDUSTRIAL HYGIENE ANALYSIS REPORT

CHEMICAL, ENVIRONMENTAL & PRODUCT EVALUATION UNIT

ALYSIS NO.	CUSTOMER	ADDRESS
156-72(11)	Certain Teed	Riverside, Calif.

MPLE SENT BY	DATE RECEIVED	DATE REPORTED	ANALYST
Jeffreys	11/17/72	1/29/73	

ATER ANALYZED

Total particulates, asbestos, % Silica

SAMPLE NUMBER	LOCATION	TEST RESULTS	THRESHOLD LIMIT VALUE (TLV)
931	Mixer man	0.57 mg 602 L 0.95 mg/M^3 total particulate	
		0.29 fibers/ml asbestos	5 fibers/ml >5μ in length asbest
		14.5% quartz	1.71 mg/M^3 quart for total dust
939	Saw operator	0.15 mg 499.2 L 0.30 mg/M^3 total particulate	
		0.02 fibers/ml asbestos	5 fibers/ml >5μ in length asbest
		23.5% quartz	1.13 mg/M^3 quart for total dust
911	#2 Lathe - operator end	0.14 mg 212.8 L 0.66 mg/M^3 total particulate	
		0.08 fibers/ml asbestos	5 fibers/ml >5μ in length asbest
		10.1% quartz	2.29 mg/M^3 quart for total dust
940	F-M Lathe	0.13 mg 202.9 L 0.64 mg/M^3 total particulate	
		0.06 fibers/ml asbestos	5 fibers/ml >5μ in length asbest
		22.6% quartz	1.17 mg/M^3 quart for total dust

ALYTICAL METHOD

Gravimetry
Microscopy
Colorimetry

CTD023509

TABLE IV-1
(Continued)

ngineering
NDUSTRIAL HYGIENE ANALYSIS REPORT

CHEMICAL, ENVIRONMENTAL & PRODUCT EVALUATION UNIT

ALYSIS NO.	CUSTOMER		ADDRESS
MPLE SENT BY	DATE RECEIVED	DATE REPORTED	ANALYST
ATER ALYZED			

SAMPLE NUMBER	LOCATION	TEST RESULTS	THRESHOLD LIMIT VALUE (TLV)
798	Coupling cut-off	0.50 mg 191.8 L 2.60 mg/M^3 total particulate	
		0.06 fibers/ml asbestos	5 fibers/ml >5 μ in length asbest
		7.1% quartz	2.97 mg/M^3 quart for total dust
936	Asbestos dump station	0.20 mg 632.8 L 0.32 mg/M^3 total particulate	
		0.06 fibers/ml asbestos	5 fibers/ml >5μ in length asbest
		53.0% quartz	0.54 mg/M^3 quart for total dust
918	#2 Boring mill	0.50 mg 186.3 L 2.7 mg/M^3 total particulate	
		0.11 fibers/ml asbestos	5 fibers/ml >5μ in length asbest
		10.6% quartz	2.21 mg/M^3 quart for total dust
920	#2 Lathe - asst. oper. end	0.40 mg 211.3 L 1.9 mg/M^3 total particulate	
		0.13 fibers/ml asbestos	5 fibers/ml >5μ in length asbest
		7.4% quartz	2.88 mg/M^3 quart for total dust

ALYTICAL METHOD

CTD023510

ngineering
NDUSTRIAL HYGIENE ANALYSIS REPORT (Continued) 3

CHEMICAL, ENVIRONMENTAL & PRODUCT EVALUATION UNIT

ALYSIS NO.	CUSTOMER		ADDRESS
AMPLE SENT BY	DATE RECEIVED	DATE REPORTED	ANALYST

ATE ANALYZED

SAMPLE NUMBER	LOCATION	TEST RESULTS	THRESHOLD LIMIT VALUE (TLV)
907	Fittings dept. #2 Gredrill	0.75 mg 191.8 L 3.9 mg/M^3 total particulate	
		0.20 fibers/ml asbestos	5 fibers/ml >5μ in length asbest
		10.2% quartz	2.27 mg/M^3 quart for total dust
914	Fitting assembly bench	Sample voided by engineer.	
937	#1 Boring mill	0.18 mg 158.5 L 1.1 mg/M^3 total particulate	
		0.05 fibers/ml asbestos	5 fibers/ml >5μ in length asbest
		7.8% quartz	2.77 mg/M^3 quart for total dust
928	Saw (cut-off)	0.30 mg 151.2 L 1.98 mg/M^3 total particulate	
		0.18 fibers/ml asbestos	5 fibers/ml >5μ in length asbest
		21.6% quartz	1.22 mg/M^3 quart for total dust
913	Coupling wet tester	0.44 mg 201.6 L 2.2 mg/M^3 total particulate	
		0.21 fibers/ml asbestos	5 fibers/ml >5μ in length asbes

NALYTICAL METHOD

CTD023511

TABLE IV-1
(Continued)

ngineering
INDUSTRIAL HYGIENE ANALYSIS REPORT

4

CHEMICAL, ENVIRONMENTAL & PRODUCT EVALUATION UNIT

ALYSIS NO.	CUSTOMER		ADDRESS
MPL T BY	DATE RECEIVED	DATE REPORTED	ANALYST

TERIAL ANALYZED

SAMPLE NUMBER	LOCATION	TEST RESULTS	THRESHOLD LIMIT VALUE (TLV)
		17.4% quartz	1.47 mg/M^3 quart for total dust
929	Fitting assembly bench	0.11 mg 205.7 L 0.53 mg/M^3 total particulate	
		0.11 fibers/ml asbestos	5 fibers/ml >5μ in length asbest
		Quartz - none detected	
673	Line 2 - Packaging end	0.17 mg 211.3 L 0.80 mg/M^3 total particulate	
		0.10 fibers/ml asbestos	5 fibers/ml >5μ in length asbest
		Quartz - none detected	
951	mixer man	0.40 mg 796 L 0.50 mg/M^3 total particulate	
		0.09 fibers/ml asbestos	5 fibers/ml >5μ in length asbest
		19.1% quartz	1.36 mg/M^3 quart for total dust
926	F-M Lathe operator	0.20 mg 231 L 0.87 mg/M^3 total particulate	
		0.11 fibers/ml asbestos 23.6% quartz	5 fibers/ml >5μ in length asbest 1.13 mg/M^3 quar for total dust

NALYTICAL METHOD

CTD023512

ngineering
NDUSTRIAL HYGIENE ANALYSIS REPORT

CHEMICAL, ENVIRONMENTAL & PRODUCT EVALUATION UNIT

ALYSIS NO.	CUSTOMER		ADDRESS
MPLE SENT BY	DATE RECEIVED	DATE REPORTED	ANALYST

ATE ANALYZED

SAMPLE NUMBER	LOCATION	TEST RESULTS	THRESHOLD LIMIT VALUE (TLV)
773	#2 Lathe operator - operator's end	0.27 mg 165.2 L 1.6 mg/M^3 total particulate	
		0.05 fibers/ml asbestos	5 fibers/ml >5μ in length asbest
		13.1% quartz	1.86 mg/M^3 quart for total dust
745	Cut-off saw	0.01 mg 170.8 L 0.06 mg/M^3 total particulate	
		0.07 fibers/ml asbestos	5 fibers/ml >5μ in length asbest
		quartz - none detected	
661	Coupling cut-off	0.74 mg 172.4 L 4.3 mg/M^3 total particulate	
		0.22 fibers/ml asbestos	5 fibers/ml >5μ in length asbes
		8.7% quartz	2.56 mg/M^3 quar for total dust
560	F-M Lathe	0.72 mg 164.3 L 4.4 mg/M^3 total particulate	
		Asbestos - none	detected
		0.8% quartz	7.89 mg/M^3 quar for total dust

NALYTICAL METHOD

CTD023513