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To: Mr. J. D. Pennington,
J. W. Roberts Ltd.,
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Physics Ref: PH.1932/5
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Date: 2nd November, 1965

SUBJECT

Evaluation of Airborne Dust Levels during the spraying of "Limpet" Asbestos-Cement at Belshill Swimming Baths (24.8.65)

OBJECT

To assess the efficiency of pre-damping techniques at an actual spraying site.

INTRODUCTION

Earlier tests (Ref.1) carried out in 1964 in the experimental tunnel at J. W. Roberts Ltd., Horwich have indicated that a reduction in airborne dust occurs when "Limpet" spray fibre is pre-damped with a 1% Calgon solution. It was recommended however, that these findings should be confirmed by tests carried out on an actual spraying site and therefore, in due course, a series of tests at Belshill swimming baths was arranged. This report details the work carried out at this location, pre-damping with water only, in addition to Calgon.

CONCLUSIONS

1. Pre-damping LW.25/16 spray-fibre with either 1% Calgon or water reduces the resultant airborne dust levels in the vicinity of the sprayer. The results obtained actually favour the "water pre-damped" material. This is contrary to expectation.

2. Dust levels remained relatively high for at least ten minutes after spraying had ceased.

3. A considerable health hazard is indicated when the "Limpet" is stripped in the dry state.

RECOMMENDATIONS

1. That wherever possible "Limpet" spray fibre should be pre-damped prior to application.

2. That further work be carried out at an experimental site at Horwich to establish the differences due to pre-damping with water and pre-damping with Calgon.

3. That respirators be continued to be worn after spraying has ceased by personnel frequenting the spray area.

4. That, prior to the commencement of stripping operations, the applied spray medium be thoroughly soaked with water.

SUMMARY

Airborne dust tests have been carried out during the application of "Limpet" asbestos-cement spray on site at a swimming baths under construction at Belshill (Nr. Glasgow). Membrane Filter samples have been taken in order to assess the efficiency of pre-damping techniques. The results show that both water and a 1% Calgon solution are effective in reducing the airborne dust level.

Continued:

EQUIPMENT AND MATERIAL USED

Standard Straight Gun (2" diameter)
RA Spray machine
LW.25/16 Spray mixture with TS/2 bonding emulsion
Pre-damping - 250 ccs of damping medium per 10 lbs of spray-fibre

DETAILED REPORT

(a) Spray Application

The LW.25/16 mixture was sprayed onto an area approximately 10 feet by 10 feet in the centre of the concrete ceiling. The same 100 sq ft section was stripped and doused with water before and after each of the trial periods. A reasonable "settling" period being allowed between the various treatments. The spray-gun operator stood on planks suspended approximately 7 feet from the ceiling. There was no measurable air movement in the sampling area.

(b) Sampling and Counting Techniques

Membrane filters were used for collecting the airborne dust, the sampling heads being positioned at head height at two diagonally opposite corners of the spray area. Four 5 minutes samples (flow rate = 200 ccs/min) were taken with each of the 2 heads for each of the 3 spraying conditions.

The counting technique used was that stipulated by the A.R.C. (Ref.2), only 5μ to 100μ fibres being considered for the calculation of the dust concentrations. However, in order to produce complete fibre size distributions it was also necessary to count fibres shorter than 5μ and longer than 100μ.

(c) Results

The dust concentrations and fibre size distributions are tabulated in Appendix I and II respectively. Log-probability plots of the size distributions are shown in Appendix III.

(d) Discussion of Results

Run 1. Stripping

Spray fibre had already been applied to the test area the previous week. Dust samples taken whilst this area was stripped "dry" yielded results of 81.4 and 106.7 fibres per cc, indicating that an excessive health hazard exists when the fibre is not damped before stripping.

Runs 2-5. LW.25/16 Pre-damped with 1% Calgon Solution

Unfortunately an insufficient settling period was allowed before the first trial commenced and Run 2 produced relatively high dust concentrations (24.8 and 33.0 f/cc). The remaining tests gave results varying from 6.6 to 14.4 fibres per cc.

Runs 6-9. LW.25/16 Pre-damped with Water

There are two anomalous counts in this set of results, the last run (9) producing dust concentrations of 36.0 and 74.6 f/cc. Figures ranging from 2.2 to 8.9 f/cc were obtained for the remaining samples and if Run 9 is omitted, it appears that pre-damping with water is as effective as pre-damping with a Calgon solution. This is contrary to expectation.

Continued:

Runs 10-13. L.W.25/15 - No Pre-damping

These spraying conditions produced greatly increased dust levels, results ranging from 54.9 to 260.0 f/cc being obtained. They are approximately 10 times higher than the figures associated with the pre-damped trials and apparently confirm, that pre-damping is advantageous in reducing the airborne dust in the vicinity of the sprayer.

Runs 14 and 15. Dust Hazard after Spraying

These samples were taken in order to measure the amount of dust remaining airborne after spraying had ceased. The membrane filter sample taken for the 5 minute period immediately after spraying gave a mean dust level of 21.4 f/cc, a mean of 10.5 f/cc being obtained for the following 5 minutes. These counts indicate that it is unwise for a spray-gun operator or personnel frequenting the spray area to remove their respirators soon after spraying. A "safe time" will be determined by the rate of decay of the dust level which in turn will depend upon the environment and the movement of air in the spraying zone.

Size Distributions

The log probability plots (see Appendix III) of the percentage frequencies tabulated in Appendix II are linear, only points for fibres less than 5μ diverging from the straight lines. Although the curves for the three spraying conditions are quite separate the difference in size distributions is only marginal. The slopes for the pre-damped runs and hence the shape of their distributions are similar. The un-damped counts however result in a different slope, the proportion of longer fibres being greater. No doubt the settling velocity of these larger fibres is greatly increased when "wetted" by the damping media and would therefore not be collected by the membrane filters (which were in a plane vertical to the floor).

REFERENCES

1. "An assessment of the concentration of airborne dust produced by the "Limpet" Asbestos-Cement Spray Process" by I. Harness. (14.7.64)

2. "Developments in Dust Sampling and Counting techniques in the Asbestos Industry" by Dr. S. Holmes. (Oct. 1964)

APPENDIX I

Results of Airborne Dust Samples Taken During the Application of "Limpet" Spray Fibre on Site at Belshill (Nr. Glasgow)

Run	Conditions Under Test	Dust Concentration* (F/cc)
1	Spray fibre stripped from roof dry	81.4 106.7
	Approximately 10 Minutes Settling Period	
2	LW.25/16 pre-damped with 1% Calgon solution	24.8
3		33.0 8.6
4		14.4 12.2
5		12.2 8.3 6.6
	Approximately 30 Minutes Settling Period	
6	LW.25/16 pre-damped with water	6.8
7		4.5 8.9
8		4.3 2.4
9		2.2 36.0 74.6
	Approximately 60 Minutes Settling Period (Lunch)	
10	LW.25/16 with no pre-damping	76.2
11		54.9 151.4
12	"	81.7 66.3
13		118.8 69.4 260.0
14	0-5 minutes after spraying had ceased	21.4
15	5-10 "	10.5

* Calculated for fibres 5μ - 100μ

APPENDIX II

Mean Percentage Size Distributions of Dust Samples collected during the spraying of 'Limpet' LT 25/16 Asbestos Cement (Belshill, 24.8.65.)

Spraying Conditions	Fibre Length / (μ)					
	<5	5–10	10–20	20–50	50–100	>100
(a) Predamped with 1% Calgon	44.3	31.5	12.2	8.6	2.1	1.3
(b) Predamped with water	34.9	31.9	15.4	10.8	4.9	2.1
(c) Unpredamped	26.1	35.4	10.9	15.1	3.7	0.8

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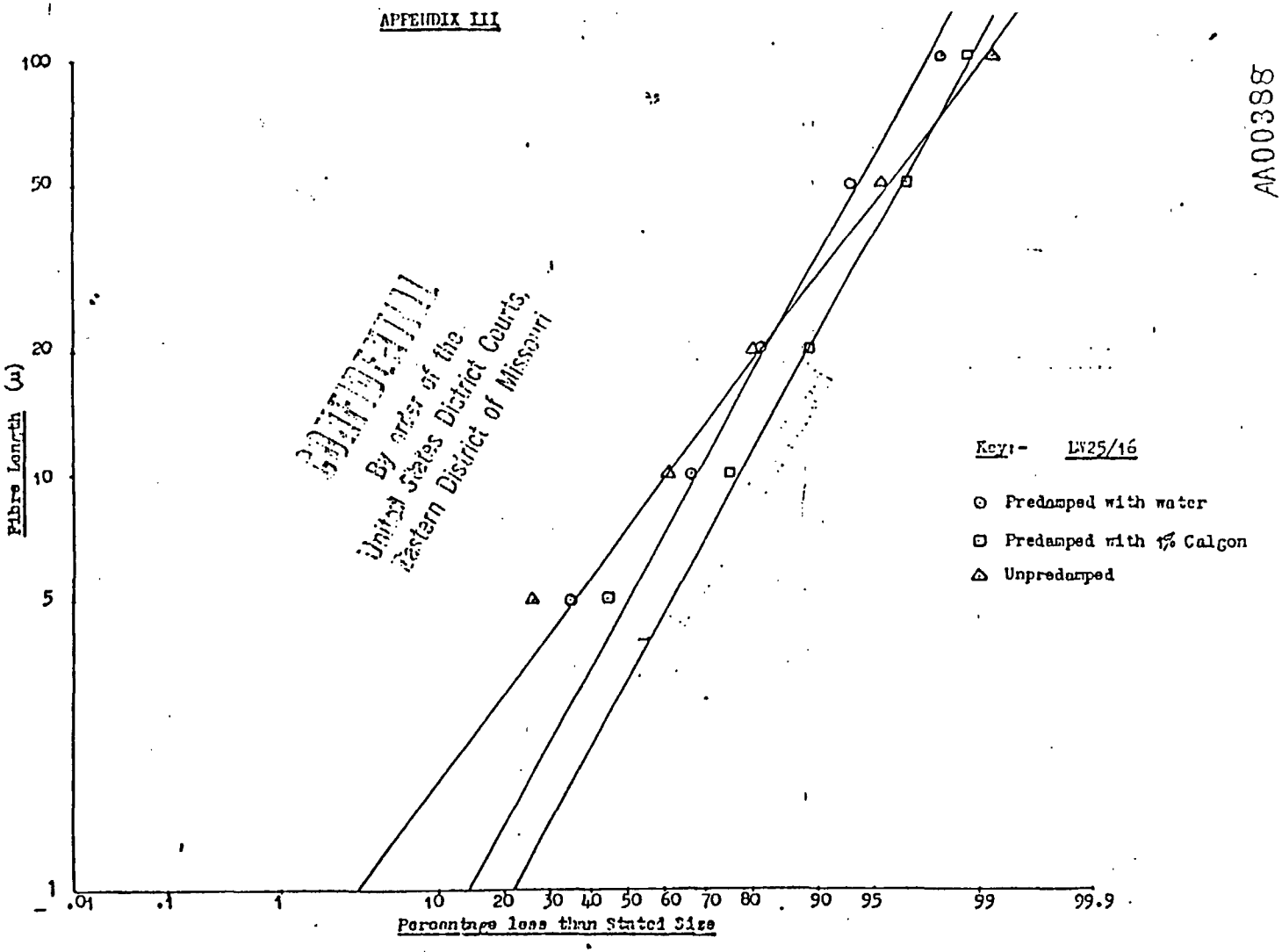
APPENDIX III

Mean % Size Distributions of Membrane Filter Counts (Belshill)



N.I.& C.Co.Ltd.

Asbestos and Health

Statement by Dr. J. F. Knox,
Medical Consultant to Turner & Newall Ltd.

Turner & Newall Ltd. has been aware of the hazards associated with asbestos manufacture since the early 30's. Following the introduction of the Asbestos Regulations in 1932 certain processes in the factories of Newalls Insulation & Chemical Co. Ltd. (then known as The Washington Chemical Co. Ltd.) were designated as needing special attention to dust control and ventilation. The arrangements made for these processes completely satisfy the Government factory inspector. Men and women working on these processes have to be given regular statutory medical inspections.

The kind of tumour referred to in recent press articles (mesothelioma) is extremely rare and is not thought to be associated with the type of asbestos used in those insulation products made at Washington which incorporate asbestos. I am not aware of any environmental hazard to people living or working near this Newalls plant.

The asbestos industry as a whole, and Turner & Newall Ltd. in particular, has for many years given much thought, money and effort to the suppression of asbestos dust and is

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continuously applying improved methods to this end. It has sponsored extensive medical investigation and programmes of scientific research at universities and elsewhere on the problems associated with asbestos and health.

N.B. No asbestos is used in the manufacturing processes of the Paisley plant of Newalls Insulation & Chemical Co. Ltd.