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'C O N F I D E N T I A L'

Assignment No. PHA.1010

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THIRD INTERIM REPORT

SUBJECT

An assessment of the concentration of airborne dust produced by the "Limpet" Asbestos-Cement Spray Process.

OBJECT

1. To carry out tests in the experimental tunnel at J. W. Roberts Ltd., in order to measure the dust levels arising from the use of various damping techniques and employment of additives to the LW.25/14 spray material.

2. To compare the dust concentrations resulting from the application of various asbestos-cement spray mixtures.

INTRODUCTION

The current series of tests assessing the dust hazard associated with "Limpet" spraying have all been carried out in the experimental tunnel erected at J. W. Roberts Ltd. The initial tests (Reference 4a) were principally concerned with the measurement of the rate of decay of the dust level, after spraying had ceased. Tests were carried out at various positions along the tunnel under both non-ventilated and ventilated conditions. The next visit (Reference 4b) was limited to the comparison of airborne dust arising from spraying LW.25/14 materials containing different additives and damped by various techniques. Tests were confined to sampling in positions adjacent to the spray operator during the application of the material, with the tunnel ventilation system running. For the first time, dust concentrations approaching the order of those experienced in the textile industry were obtained. It was therefore decided to repeat

continued:

SUMMARY

Further dust tests have been carried out during the application of "Limpet" asbestos-cement spray in the experimental tunnel at J. W. Roberts Limited. These are largely confirmatory tests assessing the effect of various damping techniques and the use of additives to the spray material. Samples have been taken by means of two "Ottway" instruments positioned adjacent to the spray-gun operator. The results are very encouraging and dust concentrations similar to those found for textile processes have been obtained. This is considered to be due to pre-damping the spray material with a 1% Calgon solution. There is also some indication that doubling the oil content also results in lower dust levels, but a combination of the two damping techniques does not appear to produce lower results than pre-damping with Calgon solution alone. It has also been confirmed that damping at the spray-gun with a 1% Calgon solution instead of water has little effect on the resultant dust concentrations.

DETAILED REPORT

1. Test Procedure

(a) Spray Application

The tunnel, spraying procedure and spraying equipment used were as described in reports reference PH.1932 and PH.1932/2. With regard to the ventilation the only difference adopted for the current tests was that a length of trunking leading out of the garage windows was connected to the outlet of the extraction unit thereby preventing re-circulation of the dust-laden air. Three control runs were carried out on each of the two latest visits as recommended (Reference 4b). The introduction of trunking appears to have little effect of the resultant dust level of the control runs, although a change in the size distributions is noticeable.

(b) Sampling Procedure

As described in Report reference PH.1932/2 (Reference 4b).

(c) Counting Technique

As described in Report reference PH.1932 (Reference 4a).

2. Results

(a) Results for the latest series of tests are tabulated in Appendix I. Tables 1 and 2 give details of dust concentrations and size distributions obtained during the two latest visits, made on 3/7/62 and 24/10/62 respectively.

(b) Dust concentrations for all test runs (covering the last four visits to J.W. Roberts Limited) using 1% Calgon at the spray-gun together with the corresponding control runs are summarised in Table 3.

continued:

(vi) No pre-damping/Supplying the spray-gun with water/Oil content doubled.

Again, the LW.25/14 containing double oil produced dust concentrations lower than those obtained with the normal oil mixture. When the ventilation draught was approximately 100 ft. per minute the reduction was quite considerable. The decrease was not so marked however when the extraction rate was less than 30 ft. per minute.

(vii) No pre-damping/Supplying the spray-gun with water/Oil content quadrupled.

The results obtained indicate that further increasing the oil does not lead to any appreciable decrease in dust level.

(viii) No pre-damping/Supplying the spray-gun with water/ Puremor oil replaced by Shell oil.

It is difficult to compare the two additives as the Shell oil mixture was sprayed early in the day on both occasions. This means that the previous control runs were the first of the day and as usual produced the highest concentrations. However, comparing the Shell oil mixture with the second control run indicates that there is no great difference between the two additives.

(b) Comparison of Hindley Green and Horwich Spray Materials (LW.25/14) and EMN 7057 Grade.

The results of the two comparisons between Hindley Green and Horwich material showed that there is no appreciable difference between the two grades. The new spray mixture EMN 7057 however, produced a relatively high dust level when sprayed, resultant concentrations being 1650 fibres per cc. downwind and 856 fibres per cc. upwind.

(c) Size distribution

The size distributions for the equivalent test runs on the recent two visits bear little or no relation to one another or to earlier evaluations. Therefore section 'B' of the conclusions of the Second Interim Report (Reference 4b) cannot be confirmed. The most probable explanation for this variation is the different conditions existing on each of the visits to J. W. Roberts Limited made to date. For example although the same ventilation system was used on the two recent occasions, the extraction draught was approximately 100 ft. per minute on 3/7/62 and less than 30 ft. per minute on 24/10/62. On the first of these dates there was a natural draught assisting the extraction unit but on the second visit this condition could not be repeated. Also, it should be noted that the size distributions of the 1% Calgon solution pre-damped runs are somewhat tentative because of the small number of fibres counted. It would be an advantage to have a variable ventilation system available so that the extraction draught could be kept constant, and also it would be possible to investigate the effect of the air velocity on the resulting size distribution and dust levels.

continued:

APPENDIX I TABLE 1

Results of "Ottway" Dust Samples Taken During "Limpet" Spraying (3.7.62)

Spraying Conditions					Downwind				Upwind			
Run	Spraying material	Additives	Spray-Gun solution	Pre-Damping	Dust Conc. Fibres/cc.	% Size Distribution 5-20μ	20-50μ	50-100μ	Dust Conc. Fibres/cc.	% Size Distribution 5-20μ	20-50μ	50-100μ
I (Control)	LW.25/14 (Hornish)	Normal Oil (Puremor)	Water	None	*	-	-	-	725	51.9	39.2	8.9
II	"	4 x Normal Oil	"	"	68	46.1	39.6	14.3	24	51.1	25.5	23.4
III	"	Shell Oil	"	"	263	46.3	41.9	11.8	153	49.8	33.2	17.0
IV	"	2 x Normal Oil	"	"	39	41.1	42.5	16.4	29	49.1	36.4	14.5
V (Control)	"	Normal Oil	"	"	689	50.5	40.4	9.1	73 ‡	51.5	32.6	15.9
LUNCH BREAK												
VI	LW.25/14 (Kindley Green)	Normal Oil	"	"	331	48.8	40.2	11.0	58	46.4	40.9	12.7
VII (Control)	LW.25/14 (Hornish)	"	"	"	283	39.4	41.9	18.7	199	42.1	40.3	17.6
VIII	"	"	"	1% Calgon Solution	14	44.5	22.2	33.3	18	37.0	55.6	7.4
IX	"	2 x Normal Oil	"	"	51 ∮	59.6	33.3	7.1	6	75.0	16.7	8.3
X	"	2 x Normal Oil	1% Calgon Solution	"	16	69.0	17.2	13.8	12	52.1	26.1	21.8
XI	"	Normal Oil	"	None	285	42.9	37.8	19.3	247	42.1	43.3	14.6

* Aspirator failed to function properly.
∮ Only 13 ccs. sample taken because aspirator jet was blocked.
‡ Check count by different observer gave concentration of 72 fibres per cc.
Extraction Draught = 104 ± 13 feet per minute (Mean of 21 Anemometer readings).

APPENDIX I TABLE 2

Results of "Ottway" Dust Samples Taken During "Linnet" Spraying (24.10.62)

Spraying Conditions					Downwind				Upwind			
Run	Spraying material	Additives	Spray-Gun solution	Pre-Damping	Dust Conc. Fibres/cc.	% Size Distribution 5-20μ	20-50μ	50-100μ	Dust Conc. Fibres/cc.	% Size Distribution 5-20μ	20-50μ	50-100μ
I (Control)	LW.25/14 (Horwich)	Normal Oil (Puremor)	Water	None	1160	49.0	42.6	8.4	850	53.3	38.0	8.7
II	"	Shell Oil	"	"	868	55.9	34.0	10.1	192	58.1	35.3	6.6
III	"	2 x Normal Oil	"	"	258	36.7	44.9	18.4	142	41.0	42.2	16.8
IV (Control)	"	Normal Oil	"	"	485	51.9	36.1	12.0	243	56.8	33.8	9.4
V	LW.25/14 (Hindley Green)	"	"	"	874	63.1	28.6	8.3	216	50.9	36.1	13.0
LUNCH BREAK												
VI	LW.25/14 (Horwich)	"	"	1% Calgon Solution	20	52.6	31.6	15.8	15	60.8	17.8	21.4
VII	"	2 x Normal Oil	"	"	16	54.8	35.5	9.7	16	61.3	29.0	9.7
VIII	"	"	1% Calgon Solution	"	24 *	68.9	28.9	2.2	8	85.7	-	14.3
IX	"	Normal Oil	"	None	681	52.3	35.5	12.2	227	57.3	34.8	7.9
X (Control)	"	"	Water	"	635	60.0	29.7	10.3	218	49.1	41.4	9.5
XI	"	20% Calgon Solution	"	"	4140	73.4	20.1	6.5	1686	80.3	15.0	4.7
XII	BMN 7057	Normal Oil	"	"	1650	66.6	28.5	4.9	856	64.5	31.2	4.3

* Aggregate of asbestos fibres present on "Ottway" trace (counted).
Extraction Draught < 30 feet per minute.

APPENDIX I TABLE 3

Summary of Results for Test Runs in which the Spray-Gun was supplied with a 1% Calgon Solution

Date	Ventilation	Spray-Gun Solution	
		1% Calgon	Water *
		Dust Concentrations (Fibres/cc.)	
30.11.61	Off	478 340	706 669
14.3.62	On	615 474	447 397
3.7.62	On	286 247	283 199
24.10.62	On	635 218	681 227

* Nearest Control Run.