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**Asbestos Emission Tests in Salon Hood-Style
Hairdryers**

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Midland Dryer Services

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EXECUTIVE SUMMARY

Objectives

The objectives of this investigation were to:

1. simulate the standard operations of salon hood-style hairdryers;
2. measure the fibre release from elements, both asbestos and non-asbestos, into the immediate environment;
3. measure the fibre release and so potential exposure from asbestos elements contained within salon hood-style hairdryers to clients seated immediately under the dryers;
4. assess the results obtained from the fibre counts obtained from the dust collected on the filters sampling to air in the breathing zones; and
5. discuss the implications of the findings and make recommendations.

Main Findings

Polarised light microscopy analysis of the various hood style hairdryer components showed that the type of asbestos used as the element supports was chrysotile at a quantity of >50% w/w. A non-asbestos PTFE element support in a hairdryer was used as a control and two other types of commonly found hairdryer containing asbestos were tested; these were the manufactured salon hood-style hairdryers La Reine and Suter Avante. The La Reine hairdryer contained a chrysotile asbestos string supporting the heating element within the dryer hood and the Suter Avante contained asbestos as an insulation layer also supporting the internal heating element.

The driers were operated inside a test chamber (here referred to as the orange box) and air samples were taken. Short and long period tests were carried out in order to simulate the operations of the hairdryers that would occur in the salon environment and that were described as common practice. The tests involved were therefore one-hour high volume sampling tests and also eight-hour sampling tests.

The one hour tests were carried out for both of the main hairdryer types and used an average sampling flow rate of 10 l/min while the eight hour tests used an average of 7 l/min. Following the sampling of the air whilst the dryers were running, filters were prepared and counted using Phase Contrast Microscopy (PCM). Countable fibres were defined as any object which is longer than 5µm, with a width less than 3µm and having aspect (length/width) ratio greater than 3:1, which does not touch (appear to touch) a non fibrous particle with a maximum dimension greater than 3µm¹.

Very few fibres were generated in any of the tests and the levels of fibres that were counted on the filters were found to be below the control limit for chrysotile of 0.3 f/ml (the control limit for chrysotile fibres will change to 0.1 f/ml in October 2006). All of the results were within the 95% Upper Confidence Limit for fibre counting rules based upon HSG248¹.

Summary Table of Results

Test Number	Dryer Type	Average Fibre Count Result (f/ml)	Result Below 0.01 f/ml?	Level of Asbestos Fibres Emitted Identified as a Risk?
1	Regal Mark 6 06953/05	0.00800	✓	X
3	La Reine 06945/05	0.00300	✓	X
4	La Reine 06945/05	0.00200	✓	X
5	La Reine 06945/05	0.00025	✓	X
6	La Reine 06945/05	0.00180	✓	X
7	La Reine 06945/05	0.00180	✓	X
8	La Reine 06945/05 Blank Sampling	0.00000	✓	X
9	Suter Avante 06948/05	0.00075	✓	X
10	Suter Avante 06948/05	0.00075	✓	X
11	Suter Avante 06948/05 Blank Sampling	0.00075	✓	X

Recommendations

There are a large number of hairdressing establishments that may have hairdryers containing asbestos. Following the investigation the evidence indicates that there was no measurable fibre release from the dryers that were tested. The risk for the release of fibres from the dryers is therefore considered as low, although the risk must be managed by the duty holder. The dutyholders should be aware of the potential for asbestos to be present in their equipment and they should therefore be aware of their responsibility under Regulation 4 of CAWR 2002², to manage asbestos in the workplace and also to prevent exposure to those people maintaining the equipment and anyone else who may work on the equipment such as servicing personnel. Under the Duty to Manage, all salon hood-style hairdryers in the workplace that contain asbestos should be identified. The duty holder should monitor the condition of the asbestos containing dryers and inform others (e.g. those undertaking maintenance or servicing work) of the presence of asbestos so that any exposure can be prevented and or minimised.

Although this study has shown no significant release of fibres, the need for the use of asbestos containing components is by no means necessary and there are suitable non-asbestos substitutes available (such as glass fibre and PTFE). In some establishments it may be common practice to buy second-hand equipment and although there is no ban on the second-hand purchase of equipment/items that contain asbestos, buyers purchasing second-hand equipment should be aware that they are purchasing an item, which may contain asbestos. The maintenance and repair programmes for the salon hairdryers may give an indication of the likelihood of which

types of dryers contain asbestos, in that those dryers with a good maintenance and repair record should have documentation indicating the presence of asbestos element supports. For dryers that are older and have no maintenance records there is a strong possibility that asbestos may be present. PAT testing alone is no indication of the presence of asbestos within equipment.

More sampling could be carried out as this investigation only sampled hairdryers containing asbestos components that were in good condition (these dryers were in good working order). The condition of asbestos element supports may deteriorate with time, this may result in some of the fibres being released but this would require further investigation. Previous testing carried out with regard to moving air and chrysotile fibre release, has indicated no measurable fibre release. (personal communication Dr. G. Burdett)³

Enforcing authorities need to be aware of the responsibilities of the dutyholders and so enforce the need for all asbestos products including asbestos containing dryers to be recorded on their asbestos registers. The asbestos registers need to be updated regularly and made available to anyone who may carry out servicing and maintenance to the hairdryer.

1 INTRODUCTION

1.1 BACKGROUND

The issue of the risk of exposure to asbestos from salon hairdryers was initially raised following the death of a salon worker from mesothelioma. This project was carried out in order to provide information and advice to local authorities, salon owners and workers regarding asbestos in the workplace and the risks that are posed to salon workers and their clients.

One of the main objectives of this work was to simulate the work operations of salon hood hairdryers containing chrysotile asbestos element supports. The aim of this investigation was to investigate the potential for asbestos fibre release from hairdryers in order to establish the risk to health for salon workers and their clients. There is a potential for these particular types of hairdryers to be used by hairdressers on a daily basis and continually over a period of many years, which may result in a potential long-term exposure, during their working life to chrysotile asbestos fibres. The information for the study would also assist salon owners and others in managing asbestos in their premises in addition to Local Authorities inspecting such premises.

From information supplied by Midland Dryer Services it has been suggested that there are many hairdryers being used in the workplace that still contain asbestos as insulation material or element support materials. The asbestos was used in hairdryers as a heat resistant support and also to prevent fire hazards, by providing protection should the elements over-heat or spark and catch fire. Most of these types of hairdryer were not made in the Far East as has been previously commented upon, but were actually manufactured in the UK, Germany and the Netherlands. Salon hood-style hairdryers which are thought to contain asbestos include the following manufacturers; La Reine, Suter, Wella, Kadus, Carmen, Indola, Eugene, Salon Nelson and some less common models include those manufactured by Muholus, Schwartzkopf, Kerka and Turbinator. Other models of asbestos containing hairdryers may also exist as it was common practice to sell dryers such as the Mark 6 La Reine model with a wholesaler's brand name on them instead of the La Reine manufacturer's brand name. Asbestos has been found by Midland Dryer Services in approximately 25% of all professional salon hood dryers currently still in use. (based upon personal communication, Mr. D. Kemper)⁴ This has been based upon the 1500 salons that the company services and many of these dryers are only between 10 and 20 years old. The use of chrysotile asbestos has now been prohibited by EU legislation, while in the UK the use of chrysotile asbestos has effectively been prohibited in 1999. This raises the issue that even though dryers have been manufactured 10 years ago without asbestos there may be a possibility that service engineers have used old stocks of replacement elements that contain asbestos. The likelihood of dryers being repaired with asbestos components is a particularly important issue if the dryers and the spare parts are no longer manufactured, therefore the only way of repairing damaged elements for the customer would be to use stocked spare elements that again may contain asbestos. The use of any asbestos components (including those used in repairs) is prohibited and it is imperative that all companies and engineers repairing and servicing hairdryers are aware of this.

Initial research into the use of salon hairdryers containing asbestos gave rise to several questions, all of which would need further investigation but primarily the main issue was to assess whether asbestos fibres, dislodged by the continual use of hairdryers containing asbestos element supports, were released into the ambient air to a measurable level that can be compared to the relevant limits. It is unclear to what extent salon hairdryers containing asbestos elements supports are still being used in the UK although initial investigations suggest that there still may potentially be many in workplaces that would only be identified when the dryers are repaired due to mechanical or electrical failure. Those dryers that weren't in need of repair or that were

not traceable as being used in a salon environment may remain in the public domain for many years and could potentially be sold or given away, leading to the possibility of dryers being used by people in domestic situations in their own homes.

It was therefore necessary to test the typical main types of hairdryer and assess the levels of fibre release from dryers containing asbestos element supports. A similar hood-style hairdryer containing a PTFE element was also tested and used as a control. Following each stage of testing an assessment of the fibre counts was made to establish the level of investigation needed to provide the required information for HSE and local authority regarding the risk to workers in a salon environment and the general public. The hairdryers were tested by sampling the air being circulated or expelled from the hairdryers using standard, static, sampling plastic cowls attached to high volume air sampling pumps. Any dust or fibres in the air, was collected onto 0.8µm cellulose acetate filters and the filters were then prepared and counted using optical PCM and the method and counting rules in HSG248¹.

1.2 CONTROL LIMITS

The methods for measurements of asbestos fibres in air are set out in legislation and CAWR 2002². All air sampling measurements that are used to check compliance with an action level or a control limit should be obtained by a HSC approved method. The method used in this investigation is outlined in HSG248¹.

Hairdryers are stand-alone mobile units and can be moved around a salon from one area to another, therefore the control limit that would be the most appropriate for this situation is not easily established. The main purpose of the investigation is to establish if there is any fibre release from the dryers.

It was anticipated that the level of fibre release would be quite low following the initial results obtained from the risk assessment sampling. The results of the test should be compared to the (4 hour) Control Limits for asbestos. However as the levels were expected to be much lower it is useful to compare them to the limit of quantification of the method, effectively the 'clearance indicator' or 'background/reassurance level'. Both of these methods use 480 litres sampling volume, a sampling rate of 1-16 litres/minute and both have an airborne concentration at the limit of quantification of 0.01 f/ml. The results of the simulation exercises were therefore compared with 0.01 f/ml.

1.3 REGULATIONS

Under the Approved Code of Practice (ACoP), 'The Management of Asbestos in Non-Domestic Premises, Regulation 4 of the Control of Asbestos at Work Regulations 2002², advice can be found regarding the management of the risks of asbestos. This regulation requires the dutyholder to:

- (a) take reasonable steps to find materials in their premises likely to contain asbestos and to check their condition;
- (b) presume materials contain asbestos unless there is strong evidence to suppose they do not;
- (c) make a written record of the location and condition of the asbestos and presumed asbestos containing materials (ACMs) and keep the record up to date;
- (d) assess the likelihood of anyone being exposed to these materials; and
- (e) prepare a plan to manage that risk and put it into effect to ensure that:
 - (i) any material known or presumed to contain asbestos is kept in a good state of repair;
 - (ii) any material that contains or is presumed to contain asbestos is, because of the risks associated with its location or condition, repaired or if necessary removed; and
 - (iii) information on the location and condition if the material is given to anyone potentially at risk.²

'To deal with the risks of exposure, there is a requirement in the Control of Asbestos at Work Regulations 2002 to carry out a risk assessment and to prevent exposure to asbestos fibres as far as is reasonably practicable. Since May 2004, there has been a new duty on those who have maintenance and repair responsibilities for non-domestic premises to assess those premises for the presence of asbestos and the condition of that asbestos, and to take a series of actions depending on the assessment.'⁵

As a result of the regulations there is a requirement to manage the asbestos within the work environment and therefore the asbestos contained in hairdryers would be covered under the Duty to Manage Regulation 4. The Health and Safety at Work Act 1974⁶ requires employers to conduct their work in such a way that their employees will not be exposed to health and safety risks, and to provide information to other people about their workplace which might affect their health and safety.² There is therefore a need to protect hairdressers and clients in the workplace and to assess the exposure to asbestos fibres from the use of typical salon hairdryers.

The location of the asbestos should be recorded. Due to the nature of the product and the possibility of the components becoming friable with repeated use and age it is advisable to reduce the likelihood of exposure of any person to ALARP.

2 MATERIALS AND METHODS

2.1 EQUIPMENT

All of the hairdryers used in this investigation were hairdryers supplied by Midland Dryer Services and were currently being used in hairdressing salons.

Asbestos Containing Hairdryers Used for Testing Purposes

La Reine 06945/05



Suter Avante 06948/05



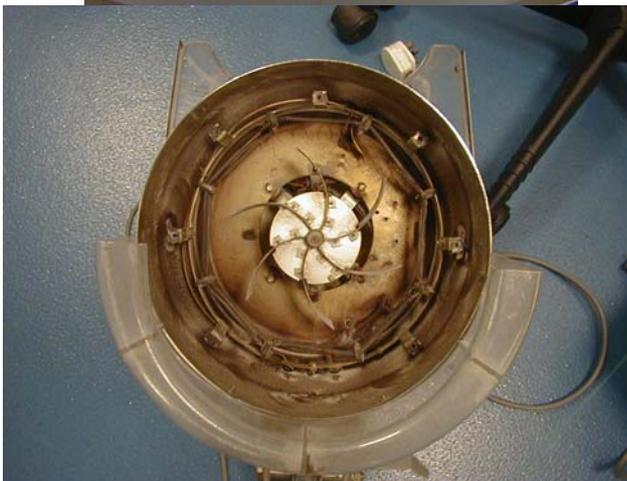
Non-Asbestos PTFE Containing Hairdryer Used for Testing Purposes

Regal Mark Six 06953/05



The dryers used in this investigation were all dryers that had recently been in use in hairdressing salons in the Midlands area, they were frequently used and were in good working order, the asbestos element supports were in good condition. The dryers were representative of dryers that are currently used in industry, in particular the two different shapes and types of air flow used in dryers. The movement of air from the dryers varies depending upon the style of dryer. Both the Regal Mark 6 and the La Reine dryers expel air in a downward motion into a circular vortex, which is then sucked back into the dryer, the process then continually repeats. This results in the air being in constant motion around the inside of the dryer and around the head area of the client sitting with their head under the dryer, this is shown in the test rig set-up photographs. In theory the movement of the air in these types of dryers should be continually circulated and contained underneath the dryer hood and should therefore not be expelled out into the salon or surrounding environment.

Photographs Illustrating La Reine Hairdryer in Detail



The Suter Avante hairdryer expels air in a downward motion but blows directly downwards and onto the client's head and face area and away from the central hood area of the dryer. The air is expelled out into the environment and is drawn back into the dryer through vents at the base of the hood.

Photographs Illustrating Suter Avante Hairdryer in Detail



All of the tests were conducted in an isolated test chamber (the orange box) with the air extraction turned off so as to allow a realistic test environment representing the situation within a hairdressing salon, whilst testing the equipment in a safe manner preventing the risk of exposure to potentially hazardous dust.

2.2 PLM ANALYSIS

Several different asbestos element supports commonly found in salon hood-style hairdryers were supplied by Midland Dryer Services, including those which were contained in the dryers used in this investigation and also some other components containing asbestos that had been found in different dryers at the time of servicing. These were all examined using Stereozoom and PLM (Polarised Light Microscopy) microscopy and were analysed for asbestos content to a UKAS accredited standard using the method in HSG248 Asbestos: *The analyst's guide for sampling, analysis and clearance procedures*¹. All of the elements supplied were found to contain only one type of asbestos fibre, which was chrysotile asbestos. The levels of asbestos were identified as significant in that the components that were examined were seen under the stereo-zoom microscope to be composed entirely of chrysotile asbestos. The use of crocidolite fibre in asbestos string products for this application in hairdryer element supports cannot be ruled out as this was often used for textile type products, although in this investigation the only type of asbestos that was observed in use was chrysotile.

2.3 SAMPLING DISCUSSION

The aim of the simulated testing of the salon hairdryers was to mimic the use of the equipment in the salon environment. The testing was carried out to reflect the routine daily operations and so the dryers were run using different temperatures, speeds and time settings. The only hairdryer that allowed flexibility in running time and was capable of being used for more than 60 minute time periods was the La Reine. This was capable of operating for as long as the dryer was switched on and therefore this was tested for 60, 240 and 480 minute intervals at both low and high temperatures. The Suter Avante had a built-in timer and could only be operated for a 60 minutes maximum time period before automatically shutting off, therefore this dryer was only tested for this time period. Blank test runs were also carried out to assess the air within the environment prior to the operation of the dryers. Blank filters were also prepared, mounted and were counted using HSG248¹ counting rules to assess that the filters were satisfactory and had not been contaminated prior to use. The dryer which was anticipated to give the highest release of asbestos fibres was the La Reine. This was due to the nature of the element support, an asbestos string that appeared upon examination to be in reasonable condition but in comparison to the other dryers was likely to be the most friable component under test.

The testing was carried out using different sampling volumes, in order to achieve the recommended 480 litres/minute sampling of the air in the environment. Some of the tests were only carried out for a period of one hour and therefore the sampling volume was higher (10 l/min) than that which was used for the eight-hour period tests (7 l/min). This was in order to achieve the recommended sampling volume of 480 litres of air at a sampling rate of 1-16 litres/minute

After the tests, the filters (including any dust or debris collected on them) were prepared and counted using HSG248¹ counting rules. All filters were cleared and mounted using the standard acetone-triacetin mounting method as illustrated in HSG248.¹

2.4 TEST RIG SET-UP

La Reine 06945/05



Suter Avante 06948/05



Following the initial background sampling for risk assessment purposes, using five pumps placed around the area in the orange box, further sampling was then carried out in order to assess the amount of fibre release in the breathing zones of any client likely to be using the hairdryers. Three cowls were set-up around the immediate area of the dummy head as shown in the photographs above with a further cowl set up to test for any fibre release into the immediate area surrounding the dryers. All of the cowls were pointed in a downwards direction except the one in the mouth of the dummy head, set up in this way so that it would be possible to assess the

likelihood of fibres being breathed in by the client using the dryer, to represent the worst case scenario.

2.5 HAIRDRYER SIMULATION TESTS

The table below gives details of the sampling tests carried out and the dryer set-ups that were used.

2.5.1 Table Illustrating Sampling Tests

TEST	DRYER TYPE AND OPERATION MODE	TEST DESCRIPTION
Test 1 06953/05	Regal Mark 6 Non-asbestos PTFE hairdryer, sampling for 60 minutes, dryer setting on high volume	4 pumps used no dummy head in place, sampling pumps set at 10l/min
Test 2 06945/05	La Reine Asbestos hairdryer, sampling for 60 minutes, dryer setting on high volume	4 pumps used, no dummy head in place, sampling pumps set at 10l/min
Test 3 06945/05	La Reine Asbestos hairdryer, sampling for 60 minutes, dryer setting on high volume, retest due to pump failure in test 2	4 pumps used no dummy head in place, sampling pumps set at 10l/min
Test 4 06945/05	La Reine Asbestos hairdryer, sampling for 480 minutes, dryer setting on medium volume	4 pumps used, no dummy head in place, sampling pumps set at 7l/min
Test 5 06945/05	La Reine Asbestos hairdryer, sampling for 480 minutes, dryer setting on medium volume, low speed low temperature	4 pumps used, dummy head in place, cowls placed in breathing zones, sampling pumps set at 7l/min
Test 6 06945/05	La Reine Asbestos hairdryer, sampling for 480 minutes, dryer setting on medium volume, rapid speed low temperature,	4 pumps used, dummy head in place, cowls placed in breathing zones, sampling pumps set at 7l/min
Test 7 06945/05	La Reine Asbestos hairdryer, sampling for 240 minutes, dryer setting on medium volume, rapid speed high temperature	4 pumps used, dummy head in place, cowls placed in breathing zones, sampling pumps set at 8l/min
Test 8 06945/05 Blank Sampling	La Reine Hairdryer turned off, dryer turned off.	4 pumps used cowls in breathing zone areas, dummy head in place, sampling for 480 minutes, still air extraction turned off, sampling pumps set at 7l/min
Test 9 06948/05	Suter Avante Asbestos hairdryer, standard speed, dryer temperature set at '5'	dummy head in place, 4 pumps used, cowls placed in breathing zones, sampling for 60 minutes, sampling pumps set at 10l/min
Test 10 06948/05	Suter Avante Asbestos hairdryer, standard speed, dryer temperature set at '8'	dummy head in place, 4 pumps used, cowls placed in breathing zones, sampling for 60 minutes, sampling pumps set at 10l/min
Test 11 06948/05 Blank Sampling	Suter Avante Hairdryer turned off, dryer turned off.	4 pumps used cowls in the same breathing zone areas, dummy head in place, sampling for 60 minutes, still air extraction turned off, sampling pumps set at 10l/min

3 RESULTS

3.1 FIBRE COUNTS (HSG248¹)

The table below shows a summary of the results that were obtained after sampling following counting of the filters using the method in HSG248.¹

3.1.1 Table Illustrating Summary of Fibre Counts

Dryer Type	Test Number	Range of Fibre Count Result (f/ml)	Average Fibre Count Result (f/ml)	Result Below 0.01 f/ml?	Upper Analytical Error (95 %Confidence Limit)
Regal Mark 6 06953/05	1	0.004 – 0.013	0.00800	✓	0.026
La Reine 06945/05	3	0.001 – 0.005	0.00300	✓	0.010
La Reine 06945/05	4	0.001 – 0.006	0.00200	✓	0.012
La Reine 06945/05	5	0.000 – 0.001	0.00025	✓	0.002
La Reine 06945/05	6	0.001 – 0.002	0.00180	✓	0.004
La Reine 06945/05	7	0.001 – 0.003	0.00180	✓	0.006
La Reine 06945/05 Blank Sampling	8	0.000 – 0.000	0.00000	✓	0.000
Suter Avante 06948/05	9	0.000 – 0.002	0.00075	✓	0.004
Suter Avante 06948/05	10	0.000 – 0.002	0.00075	✓	0.004
Suter Avante 06948/05 Blank Sampling	11	0.000 – 0.001	0.00075	✓	0.002

A full copy of the detailed report of the fibre counts that were completed can be seen in the appendix. The minimum volume of air for sampling for these tests is 480 litres and the sampling rate is 1-16 l/min. From the tests that were carried out, it can be seen that all of the results were less than the control limit, which has been set for workplace asbestos and none of the levels of fibres counted were above the control limit. The clearance limit is not an acceptable internal environment limit (it is a transient value) and so caution has to be exercised when making comparisons with this.

From the testing that was carried out on these types of salon hood style hairdryers and the results shown above, it may be concluded that there is no significant asbestos fibre release generated in the usage of the La Reine and Suter Avante types of hood-style dryer. These results though do not apply for all hairdryers in the workplace and are only representative of the two types tested. These results cannot account for all dryers used in all salon situations, particularly

other hairdryers with element supports that may be more deteriorated and so more friable than those which were used under the test conditions.

3.2 CONCLUSIONS

1. Following the testing of three types of salon hood-style hairdryers; a non-asbestos PTFE Regal Mark 6, an asbestos containing La Reine hairdryer and an asbestos containing Suter Avante hairdryer, it can be concluded that no significant asbestos (chrysotile) release was generated under any of the conditions sampled while varying time, speed and temperatures in usage.

2. The results from the sampling of the hairdryers have shown that there is no significant release of asbestos fibres. Asbestos containing salon hood-style hairdryers may still be in use and although there are many different substitutes both in terms of the actual element support materials and also in terms of the equipment, there may be a reluctance to replace the equipment within salons due to the financial implications. Therefore it may be necessary for some inspection and monitoring of the situation by local authorities.

3. Out of 1500 salons serviced by only one maintenance company, there are potentially 25% of these salons that may still be using dryers containing asbestos. There may be mobile hairdressers also using this type of equipment and there may be dryers in domestic properties being used on a regular basis. The locations and use of asbestos containing hairdryers is likely to be very difficult to monitor so the individual who has responsibility for the equipment should be aware of the possibility of the dryers containing asbestos and manage the risk.

4. This investigation has only tested dryers in relatively good condition, there may be dryers in use that are in a poor condition and this should be taken into account when managing the risk.

Further work was carried out in order to ascertain the exact type of asbestos fibres thought to have been present in the lung tissue that may have led to the mortality of the deceased. This was carried out through the examination of part of the lung tissue, using TEM analysis techniques and the identification of the asbestos bodies and fibres within the lung tissue using EDAX (Energy Dispersive X-Ray) techniques. The TEM analysis supported the findings in this investigation whereby no chrysotile fibres were identified in the lung tissue. The asbestos fibre identified in the lung tissue analysis was found to be crocidolite, several non-asbestos fibres were also identified and these were found to be man-made mineral fibres (MMMMF). The results of the TEM analysis can be seen in appendix 4.2. From the results it may be a possibility that the deceased was exposed to asbestos from an alternative source other than hairdryers, although we cannot rule out that crocidolite fibres were used in hairdryer element supports at some point.

4 APPENDICES

4.1 FIBRE COUNT AND TEM RESULT SHEETS



Laboratory Report
 Environmental Sciences Group
 Health and Safety Laboratory
 Harpur Hill, Buxton, SK17 9JN



Worksheet No.: 05-0499 Job Code: JS2003802 Receipt Date: 01-Aug-05
 Sample Origin: DLF in Orange Box
 Customer Name and address
 Date tests completed: 06/08/2005 Report issue n°.

An agency of the Health and Safety Executive

Sample mounted by:- RH

Manual Fibre Counting.

Counting rules:- MDHS39/4

Stopping Rules:- 200 Fields
 100 Fibres

Manual fibre counting is carried out in accordance with MDHS39/4 and MDHS59. Tests marked "Not UKAS accredited" in this report are not included in the UKAS accreditation schedule for this laboratory. The UKAS accreditation only covers fibre counting carried out in this laboratory and does not cover sampling. Analytical error is reported in f/ml except when the result is reported in fibre/mm² only

Sample N ^o .	Fibre/mm ²	Fibre/ml	Analytical Error		Volume	Comments
			Lower	Upper		
TEST 1-1	11.27	<0.01	0.00	0.02	600	
TEST 1-2	20.88	0.01	0.01	0.03	600	
TEST 1-3	<13		6.24	23.51		
TEST 1-4	5.63	<0.01	0.00	0.01	570	
TEST 3-1	7.29	<0.01	0.00	0.01	600	
TEST 3-2	4.31	<0.01	0.00	0.01	600	
TEST 3-3	2.32	<0.01	0.00	0.01	600	
TEST 3-4	3.65	<0.01	0.00	0.01	600	
TEST 3-5	<13		1.94	11.59		
TEST 4-1	7.29	<0.01	0.00	0.01	3360	
TEST 4-2	8.95	<0.01	0.00	0.01	3360	
TEST 4-3	5.63	<0.01	0.00	0.01	3360	
TEST 4-4	7.95	<0.01	0.00	0.01	3360	
TEST 4-5	7.62	<0.015	0.00	0.02	483	
TEST 5-1	5.30	<0.01	0.00	0.01	3360	
Fibre concentrations that are below the lower limit of detection are reported as < the LOD					Counted slides are stored:- Unused ½ filters are stored:-	

Reported By: R Houlihan (Analyst) Signature: Date: 06-Aug-05

Checked By: G Revell (Lab. manager / deputy) Signature: Date: 06-Aug-05

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

Samples retention time from date: 1 / 3 / 6 / 12 months / according to legal proceedings storage policy / not applicable (*choose one)

EM/1a Issued January 2004

Page 2 of Report is Shown below

Page 2 of Report is Shown below

Continuation of Worksheet:- 05-0499

Sample N ^o .	Fibre/mm ²	Fibre/ml	Analytical Error		Comments
			Lower	Upper	
TEST 5-2	3.65	<0.01	0.00	0.01	3360
TEST 5-3	0.99	<0.01	0.00	0.01	1417
TEST 5-4	2.65	<0.01	0.00	0.01	3360
TEST 6-1	15.58	0.00	0.00	0.01	3240
TEST 6-2	20.22	0.00	0.00	0.01	3360
TEST 6-3	11.27	<0.01	0.00	0.01	3120
TEST 6-4	15.58	0.00	0.00	0.01	3360
TEST 6-5	19.89	0.00	0.00	0.01	3120
TEST 7-1	12.26	<0.01	0.00	0.01	1800
TEST 7-2	11.45	<0.01	0.00	0.01	1800
TEST 7-3	7.29	<0.01	0.00	0.01	1920
TEST 7-4	5.63	<0.01	0.00	0.01	1920
TEST 7-5	11.60	<0.01	0.00	0.01	1800
BLANK 8-1	0.99	<0.01	0.00	0.01	
BLANK 8-2	0.17	<0.01	0.00	0.01	
BLANK 8-3	0.17	<0.01	0.00	0.01	
BLANK 8-4	2.32	<0.01	0.00	0.01	

5 REFERENCES

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5. Department for Work and Pensions Asbestos Related Diseases Security Administration Act 1992
6. The Health and Safety at Work Act 1974