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HEALTH & SAFETY LABORATORY

Investigation Into Fibre Release From Church Organ Blower Boxes

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CONTENTS

EXECUTIVE SUMMARY

Objectives

To examine an organ blower box lined with asbestos and to gain information regarding the use of asbestos in this type of product and the type of asbestos containing material used.

To ascertain the level and type of asbestos fibre contamination in organ pipes following use of the above organ blower box for many years at St. Mary's church in Hunton, Maidstone.

To offer advice regarding the future use of the church organ and the risk of exposure of the general public to asbestos fibres

Main Findings

The organ blower box removed from St. Mary's church in Hunton, Maidstone was identified as being lined with friable asbestos insulation board, measuring approximately one inch in thickness, on all of the internal surfaces. The asbestos fibres found to be present in the insulation board were identified by the use of PLM (Polarised Light Microscopy) analysis as amosite, chrysotile and crocidolite asbestos. It was necessary to establish the level of contamination (if any) inside the organ pipes that were fed with air from the asbestos lined organ blower box and so the dust from inside the pipes was sucked onto cellulose acetate filters and was analysed using PLM and PCM (Phase Contrast Microscopy) methods. The floor and other surface areas surrounding the organ were also sampled and the dust was collected, this was also analysed using PLM again to determine the presence of asbestos fibres. The sampling that was carried out used static sampling methods as the organ blower had already been removed. Two of the areas that were sampled were found to have minimal levels of asbestos fibres present, these were the floor area where the blower box was removed from and the inside of the wind trunk. The fibres identified in these areas were amosite on the floor area behind the organ and amosite and chrysotile inside the wind trunk.

Recommendations

The area surrounding the organ should be re-cleaned to eliminate any remaining asbestos fibres.

Further sampling is necessary once a non-asbestos containing organ blower has been re-installed. This will enable us to determine the residual fibre release whilst the blower and the organ are functional and will involve air sampling of any potential dust that is released from inside the organ pipes whilst the organ is being played.

1 INTRODUCTION

HSL (Inorganics and Fibres Section) were asked to investigate the possible asbestos fibre release from church organ blower boxes. The work was carried out for Maidstone Borough Council under the Local Authority Science & Technology project and began following concerns raised by the church committee at St. Mary's church in Hunton, Maidstone. The primary concern was that an organ blower box had been in use in the church for a number of years was lined with an asbestos containing material, and that some of the fibres from the organ blower box may have been released into the pipes of the church organ and consequently into the main area of the church.

The organ blower had been removed before any sampling could be carried out in situ, therefore the investigation involved an analysis of the asbestos containing material inside the organ blower box and also various methods of sampling at the church. The sampling carried out at the church was in order to ascertain if any asbestos fibres could be identified in the areas surrounding the church organ, this included the organ pipes, the area where the blower box was removed from and also the areas in front of the organ.

Initial investigations involved an examination of the blower box in controlled conditions and the removal of a sample of the material lining the blower box for asbestos analysis, using Polarised Light Microscopy (PLM). Following the initial analysis, sampling was carried out at the church in Hunton, Maidstone, to conclude if there were any fibres that could be identified inside the organ pipes and in the areas of the church surrounding the organ.

2 FURTHER SECTIONS

2.1 INITIAL EXAMINATION OF BLOWER BOX

Because of the risks of the spread of and exposure to asbestos fibres this work was carried out inside a sealed chamber and the scientists carrying out these examinations wore respiratory protection (RPE), disposable coveralls and took full precautions against the spread of asbestos.

The blower box, a one-metre cube weighing about 500 kg, was received sealed in plastic and labelled as containing asbestos. On removing the plastic and tilting the box to examine the underside, loose asbestos was seen to fall from the box onto the plastic sheet on which it was standing. This dust had fallen through a 3-inch rectangular hole running the full width of the floor of the box (photograph A3). PLM (Polarised Light Microscopy) analysis of this dry and friable dust found it to contain, crocidolite, amosite and chrysotile asbestos.

A series of photographs were taken showing the construction of the box and the major components of the blower. These are included in appendix 5.1 as photographs A1 – A7. From the photographs it can be observed that all of the walls are lined with asbestos insulation boards measuring approximately one inch in thickness. It is thought that the blower boxes were lined with these boards to act as a heat or fire-guard and also to suppress the noise of the motor and blower.

The presence of asbestos and the need to take appropriate precautions including the use of powered RPE restricted the possible testing options. Under the circumstances it was not feasible to power up the blower box and monitor airborne fibre emissions as this would have required an electrician (who was fully trained to work with asbestos using protective equipment and risk assessed operations), to re-connect the organ blower box to an air movement system which would simulate the use of the blower box when powering a church organ. The risk of exposure to asbestos fibres in relation to the testing options was assessed and the outcome was that due to the nature of the asbestos containing material discovered in the blower box, the possibility of fibre release both in terms of asbestos fibre type and friability was too high. The risk to health was too great to pursue any moving air sampling using the organ blower box.

Some airborne fibre generation is highly likely within the blower box but how much, if any, of this airborne material would be emitted into the church environment (or other surrounds) is unclear as the elutriation effects of the pipes connecting it to the organ and the organ pipes themselves would, in all probability, drastically modify airborne fibre releases. Consequently it is unlikely any measurements from the output of the box would be of any significance.

2.2 HOW THE BLOWER BOX WORKS

Air is drawn into the box through the rectangular opening (~10 x 80 cm) underneath the box, which is supported by four 'feet' (~ 2 x 10 cm) that raise it slightly from the floor on which it would rest. The air then moves into the blower and is expelled through the smaller hole via a flexible coupling in the side of the box into the organ pipes. The organ blower was not in a functioning state when received and was not operated at HSL. The organ blower box had been removed from the site by an external company and following initial examination of the box and lining material the asbestos content and friability of the material it was concluded unsafe to test.

2.3 PLM (POLARISED LIGHT MICROSCOPY) ANALYSIS

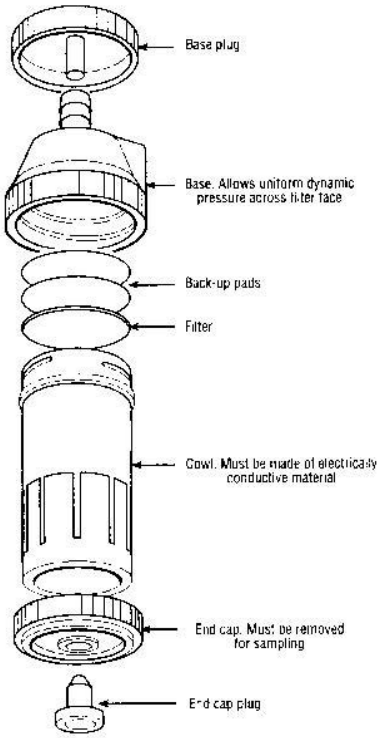
The insulation material from the inside of the organ blower box was examined using Stereozoom and PLM (Polarised Light Microscopy) microscopy and a sub-sample was analysed for asbestos content to a UKAS accredited standard using the method in HSG248 Asbestos: The analyst's guide for sampling, analysis and clearance procedures[1]. The sample was found to contain Amosite, Chrysotile and also Crocidolite asbestos fibres and was very friable. It is unclear if the material has become more friable with age, exposure to heat and moving air, but this may explain the current state of the blower box lining. (This can be seen in the photographs in appendix A.)

2.4 SAMPLING

Following the initial examination of the organ blower box and the PLM analysis of the asbestos material, it was necessary to carry out further testing at the site to ascertain the level (if any) of asbestos fibres that were potentially present in the organ pipes and also the areas surrounding the organ blower and the organ. Previous sampling had been carried out at the church upon request of Mr. D. Way (church council at St. Mary's church, Hunton) and although the reports were available most of the samples taken (swabs and air filter samples) had been disposed of. It was therefore necessary to carry out sampling again to conclude if there was a risk to maintenance personnel and also the public from asbestos fibres.

The swab and air sampling was carried out by Mr. V. Sandys (HSL Outbased Field Scientist, East Grinstead) with the assistance of Mr. M. K. Cross (church organ builders). Samples were taken from inside the organ pipes using both in-line filter holders and standard asbestos sampling cowls (as shown in figure 1) loaded with filters (cellulose acetate), by sucking the air up from inside the pipes using high volume air sampling pumps. Swab samples were taken using cellulose acetate filters as the collective medium and dust debris was also collected for PLM analysis. The samples collected using the air from inside the pipes were analysed using PCM fibre counting (WHO counting rules, HSG248[1]) and those filters that were found to be heavily loaded were also analysed by PLM.

Figure 1 Diagram of Sampling Head Used



3 RESULTS

3.1 SUMMARY OF RESULTS

The test reports showing the results obtained can be seen in Appendix B. The PLM analysis of the bulk debris and debris collected on the filters showed two samples that had asbestos present. These samples were taken from inside the wind trunk of the organ and from the rear area from where the organ blower was removed. The asbestos identified in the PLM analysis was amosite and also chrysotile asbestos fibres.

The PCM fibre counts showed high levels of fibres on all of the filters but this cannot solely be attributed to asbestos fibres, by nature common dust also contains other fibres such as cellulosics and also organic fibres present. Analysis of the filters using discrimination analysis techniques has shown that two of the samples that were counted using PCM also had asbestos fibres that were identified. These samples were taken from inside the organ bellows and inside the wind trunk. These results correspond with those obtained from the PLM analysis.

4 CONCLUSIONS

The organ blower box was lined with a very friable board-like material that contained amosite, chrysotile and crocidolite asbestos fibres.

No air tests were carried out using the removed organ blower box, as the risk of exposure to asbestos fibres from the friable material was too high.

Air sampling would have ideally been carried out before the organ blower had been removed to ascertain the level of fibre release and exposure risk to the general public and those maintaining the organ. This would have included sampling whilst the organ was being played. As the blower box had been removed and sent to HSL for analysis this was not possible and so the only sampling that took place was in retrospect to conclude if any asbestos fibres were present in the residual dust in the organ pipes and the areas surrounding the organ.

The majority of the areas that were sampled were found to be free from asbestos although two of the areas that were sampled were found to contain small amounts of asbestos fibres identified as ‘trace’ amounts. The asbestos fibres identified in these areas were amosite and/or chrysotile asbestos. The definition of ‘trace’ is less than 3 fibres or fibre bundles. The level of risk, from the information obtained from results of the testing carried out, is estimated as low.

The advice regarding these contaminated areas is to clean around the areas again and ensure they are fully decontaminated. Further sampling should be carried out once a new (non-asbestos insulated) organ blower has been installed, which would involve air sampling with the blower working and the organ fully functional. This would give the worst-case scenario and therefore enable a judgement to be made on the level of fibre release from the organ pipes, in addition to the level of residual asbestos fibres (from the previous blower box) that may be released from the organ pipes. As stated previously this may be low although cannot be conclusive until further sampling has been carried out.

5 REFERENCES

1. HSG248: The Analyst’s Guide for Sampling and Clearance Procedures

6 APPENDICES

6.1 PHOTOGRAPHS OF THE ORGAN BLOWER BOX

Photograph A1: The Organ Blower Box

Photograph A2: The Inside of the Box Showing the Motor and the Blower Unit.

Photograph A3: The Underside of the Blower Box

Photograph A4: Underside of Blower Box Lid

Photograph A5: Inside the Organ Blower (Via Flexible Coupling) from Air Outlet Hole

Photograph A6: Inside of Blower Box

Photograph A7: Electric Cable to Motor

6.2 ANALYSIS REPORTS (PLM, DISCRIMINATION AND PCM)