

# **QUEANBEYAN STUDY**

## **ASBESTOS IN PRIVATE HOMES**

*SOUTH EASTERN PUBLIC HEALTH UNIT  
N.S.W. HEALTH DEPARTMENT*

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#### SYNOPSIS

Between 14 July and 3 September 1993 a study was carried out to measure the level of asbestos fibres present in dust and air in the living areas of homes in the City of Queanbeyan (popl. 24,000) where the roof space was insulated with loose asbestos.

The purpose of the study was to assess the health risk to the occupants of ~~private homes where asbestos roof insulation is installed~~, and to determine whether containment of the asbestos within the roofspace was a safe interim measure to prevent the entry of asbestos fibres into habitable areas.

#### BACKGROUND

During the 1960's and 70's, a private contractor in the Canberra/Queanbeyan area, insulated private homes by pumping loose asbestos fibres into the roofspace. Asbestos exhibits excellent thermal insulation properties, is non-combustible, resistant to corrosion or decay and was relatively inexpensive.

Warren Matthews (Environmental Health Officer) from South Eastern Public Health Unit of the NSW Health Department has provided an asbestos identification service to the public and local councils in South Eastern NSW for the past 6 years. Samples are examined using a polarising light, optical microscope. During that time about 35 samples of roof insulation have been submitted from homes in Queanbeyan, of which seven (7) have been found to contain Brown Asbestos (Amosite). Where asbestos was identified the owners were advised to seal all wall & ceiling vents, cracks, exhaust fans and manholes, to prevent the entry of asbestos fibres into the dwelling. Where dwellings were to be renovated, demolished, or if disturbance of the fibres was unavoidable, it was recommended that the asbestos be removed by a licensed asbestos removal contractor. Queanbeyan City Council played an active role in arranging for collection of samples and conveying information to homeowners, and also notified the local fire brigade of those homes found to contain loose asbestos roof insulation.

48 samples to end '93

and Telecom

#### METHODOLOGY

The seven homes containing asbestos roof insulation, and two control homes which were free of asbestos, were inspected and a questionnaire was completed. The results are summarised in Table "I".

Participation in the study was voluntary and the owners/occupiers were most cooperative. All private details will be kept strictly confidential, and the premises will only be referred to by a designated Number.

## SAMPLING

Three types of samples were collected from each dwelling and included:

- (i) One Static volumetric air sample over a 24 hour period and the sample was collected on a 25mm 0.4 micron Nucleopore filter. Dynavac vacuum pumps (6 volt) were supplied by WorkCover Authority and were Calibrated to a Platon flow tube which had been calibrated using a soap bubble flow calibration device at the WorkCover Laboratory in Kent Street Sydney. Flow readings were made at the commencement and conclusion of each test. While the monitors normally operate on a D.C. battery supply, a 240 volt transformer was used to allow continuous 24 hour operation. An earth leakage device was installed on the domestic power supply to safeguard against electrical faults.
- (ii) Personal Air Samples involved a resident wearing a portable sampling pump (SKC Airchek volumetric samplers - model 224-PCXR7) for up to eight (8) hours, during which time normal daily activities including vacuuming carpets were carried out. The same filters and method of calibration were applied as in (i) above.
- (iii) Bulk dust samples were collected from carpets, lounges and curtains using the same personal sampling pumps referred to in (ii) above and a 25mm 0.8 micron cellulose filter membrane was used.

While the proposed sample flow rates were 8 litres/minute for static samples and 3.5 litres /minute for personal samples, this was found to be unachievable with the sampling equipment utilised, as it resulted in overheating and pump failure. The static samples were finally set between 5 and 6 litres/min and personal samplers were operated at 3 litres/min.

## ANALYSIS

Samples referred to in (i) & (ii) above were delivered to the WorkSafe Laboratory in Sydney for processing prior to analysis by Transmission Electron Microscopy (TEM) at Sydney University.

The Bulk samples (iii) were examined for the presence of asbestos fibres using a polarised light optical microscope. For each sample 50 fields were scanned using 400x magnification. The criteria for defining respirable asbestos fibres was: fibres exceeding 5 microns in length and less than 3 microns thick.

## DISCUSSION

The dwellings were in four basic categories:

- (a) No asbestos roof insulation (controls);

- (b) Asbestos roof insulation with vents and manholes sealed;
- (c) Asbestos roof insulation but with vents and manholes NOT sealed;
- (d) Premises from which the asbestos had been removed professionally.

The carpets had been renewed in House No. 3 after the asbestos was removed, and had also been recently replaced in houses No. 1 & 5. The asbestos in house No. 1 had been covered with fibreglass batts which would tend to restrict the movement of fibres in the roof space. The manhole was located externally in house No's 1 & 7.

## RESULTS

Refer to the Attached report from Worksafe Australia, and Table II

The only Amosite fibre identified in the static samples was from premises No. 3, where the asbestos roof insulation had been removed in 1992. One crocidolite fibre was identified in the static sample. The fact that premises No. 9 was located on a main road may account for the identification of one (1) crocidolite fibre in the static sample. This premises was not installed with loose asbestos roof insulation.

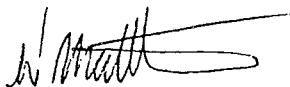
One small bunch of chrysotile fibres was identified from the curtains in Premises No. 2, and one amosite fibre was noted in curtains in premises No. 8. The latter premises was not insulated with asbestos.

*brake shoe  
asbestos*

Many filters were heavily loaded with particulate, organic material and cellulose type fibres.

## CONCLUSIONS

The absence of asbestos fibres in all but two samples of house dust suggests that the material is being contained within the roof space. The results of static and personal samples were also consistent with the findings from the bulk dust analysis. The risk to the occupants is therefore insignificant. There remains a risk to any person entering the roof space and this issue requires further investigation.



**WARREN MATTHEWS**  
Environmental Health Officer  
22 October, 1993

TABLE I:

## DESCRIPTION OF DWELLINGS

|                                     |                | HOUSE IDENTIFICATION NUMBER |      |      |      |      |      |      |      |      |
|-------------------------------------|----------------|-----------------------------|------|------|------|------|------|------|------|------|
|                                     |                | 1                           | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    |
| DATE OCCUPIED                       |                | 1953                        | 1989 | 1992 | 1993 | ?    | 1992 | 1967 |      | 1991 |
| NUMBER OF RESIDENTS                 |                | 2                           | 5    | 6    | 4    | 2    | 5    | 1    | 3    | 2    |
| CLOSE TO MAIN ROAD /INDUSTRIAL AREA |                | NO                          | NO   | NO   | NO   | YES  | YES  | NO   | NO   | YES  |
| <u>CONSTRUCTION</u>                 |                |                             |      |      |      |      |      |      |      |      |
| WALLS                               |                | * AC                        | B/V  | B/V  | B/V  | B/V  | *WB  | D.B. | B/V  | WB   |
| ROOF                                |                | TILE                        | TILE | TILE | TILE | TILE | TILE | TILE | TILE | IRON |
| AGE (YEARS)                         |                | 40                          | 17   | 19   | 18   | 40   | 40+  | 26   | 14   | 35   |
| BEDROOMS                            |                | 3                           | 3    | 4    | 4    | 3    | 4    | 3    | 4    | 2    |
| DATE ASBESTOS INSTALLED             |                | 1959                        | 1979 | NON  | ?    | ?    | ?    | ?    | N/A  | N/A  |
| SARKING/SISALATION                  |                | NO                          | NO   | NO   | ?    | ?    | NO   | NO   | NO   | ?    |
| VENTS                               | EXT. WALLS     | NO                          | NO   | NO   | NO   | YES  | YES  | YES  | NO   | YES  |
|                                     | SEALED Y/N     | N/A                         | N/A  | N/A  | N/A  | NO   | NO   | NO   | N/A  | NO   |
|                                     | INT. WALLS     | YES                         | YES  | NO   | YES  | YES  | YES  | YES  | NO   | YES  |
|                                     | SEALED Y/N     | NO                          | YES  | N/A  | YES  | NO   | NO   | NO   | N/A  | NO   |
|                                     | CEILINGS Y/N   | YES                         | YES  | NO   | YES  | NO   | NO   | NO   | NO   | NO   |
|                                     | SEALED Y/N     | NO                          | YES  | N/A  | YES  | N/A  | N/A  | N/A  | N/A  | N/A  |
| EXHAUST FANS Y/N                    |                | NO                          | NO   | YES  | NO   | YES  | YES  | YES  | YES  | YES  |
| SEALED Y/N                          |                | N/A                         | N/A  | N/A  | N/A  | YES  | NO   | YES  | NO   | NO   |
| MAN-HOLE                            | SIGNPOSTED Y/N | NO                          | NO   | N/A  | YES  | NO   | NO   | NO   | N/A  | N/A  |
|                                     | SEALED Y/N     | NO                          | YES  | N/A  | YES  | NO   | NO   | NO   | N/A  | N/A  |
| CARPETS Y/N                         |                | YES                         | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  |
| CURTAINS Y/N                        |                | YES                         | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  |
| DUCTED HEATING/AC Y/N               |                | NO                          | YES  | NO   | NO   | NO   | NO   | NO   | NO   | NO   |

KEY: AC - Asbestos Cement sheeting; \* - Cladding (aluminium or imitation brick);  
B/V - Brick Veneer; D.B. - Double Brick; WB - Weatherboard

RESULTS

CONTROLS

TABLE II:

|   | 1    | 2    | 3    | 4    | 5 | 6    | 7    | 8    | 9    |
|---|------|------|------|------|---|------|------|------|------|
| STATIC                                    | 0/96 | 0/96 | 1/96 | 0/96 | - | 0/96 | 0/96 | 0/96 | 1/96 |
| PERSONAL                                  | 0/96 | 0/96 | 0/96 | -    | - | 0/96 | -    | 0/96 | 0/96 |
| BULK SAMPLES<br>ASBESTOS FIBRES/50 FIELDS |      |      |      |      |   |      |      |      |      |
| CARPET                                    | 0    | 0    | 0    | 0    | 0 | 0    | 0    | 0    | 0    |
| LOUNGE                                    | 0    | 0    | 0    | 0    | 0 | 0    | 0    | 0    | 0    |
| CURTAINS                                  | 0    | 1    | 0    | 0    | 0 | 0    | 0    | 1    | 0    |

ACKNOWLEDGMENTS

I wish express my appreciation to the owners and occupiers of the homes involved in the study and also the following for their invaluable assistance:

From WorkCover Authority;  
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John Lee  
Trevor May

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From Queanbeyan City Council;  
Bob Whitworth  
Mike Thompson  
Natasha Hicks

From Queanbeyan Hospital;  
Bill Dargaville and staff

EPI Branch  
Steve Corbett  
Marie-Louise Stokes



WORKSAFE AUSTRALIA  
NATIONAL OCCUPATIONAL HEALTH & SAFETY COMMISSION

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NATIONAL INSTITUTE OF  
OCCUPATIONAL HEALTH & SAFETY

Mr. Warren Mathews  
Public Health Unit  
Health Department of NSW  
Locked Bag 11  
GOULBURN NSW 2580

Dear Sir,

Re: TEM Analysis of Air Samples for Asbestos  
in Queanbeyan Houses

A total of fifteen samples and two blank samples were received by this laboratory in two batches. The first batch consisted of six samples (P1, P2, P8, S1, S2 and S8) and one blank sample received on 11th August, 1993. The second batch consisted of nine samples (S3, S4, S6, S6A, S7, S9, P3, P6 and P9) and one blank sample received on 7th September, 1993. The membrane filter samples were examined according to the TEM method as is registered with NATA.

#### Sample Preparation

The samples were carbon coated again to create a carbon sandwich. TEM grids were prepared by cutting the carbon coated filter into 2mm squares and placing them onto gold grids and lowered into a modified Jaffe wash containing chloroform (Method NIOHS/TEM/MFM2). Within twenty four hours the nuclepore filter is dissolved and the fibres remain in a thin carbon film on the gold support grids.

#### Analytical Technique

The personal and static air samples were examined under analytical Transmission Electron Microscopy (ATEM) at a magnification of 8800X and the fibrous minerals were analysed using Energy Dispersive X-Ray Analysis (EDAX) and Selected Area Electron Diffraction patterns (SAED). The fibrous minerals present were identified on the basis of morphology and elemental composition. Fibre length and diameter were measured directly off the screen using the precalibrated measurement mode of the instrument. Eighty grid openings were examined for the samples (4 grids @ 20 openings). The grid openings were sized by light microscopy and the results reported in number of fibres per equivalent Walton Beckett graticule areas.

#### Mailing address

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#### Telecommunications

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## Results

The results, presented are calculated results based on the detection limit:

| NIOHS<br>Lab No. | Sample<br>No.  | Sample<br>Volume<br>(litres)* | No. fibres/fields (W.B.G.)**                    |                                   | Asbestos***<br>Fibres/mL.<br>(n=4) |
|------------------|--|-------------------------------|---|-----------------------------------|------------------------------------|
|                  |  |                               | Non Asbestos<br>(>5um Length,<br>0.2-3um Width) | Asbestos<br>(all length<br>sizes) |                                    |
| 492-93           | P1   | 1440                          | 3/96  | 0/96                              | <0.0014                            |
| 493-93           | P2   | 1395                          | 8/96  | 0/96                              | <0.0015                            |
| 494-93           | P8   | 1440                          | 21/96   | 0/96                              | <0.0014                            |
| 495-93           | S1   | 1800                          | 3/96  | 0/96                              | <0.0012                            |
| 496-93           | S2   | 1773                          | 19/96   | 0/96                              | <0.0017                            |
| 497-93           | S8   | 7200                          | 2/96  | 0/96                              | <0.0003                            |
| 498-93           | Blank-(as per batch)   |                               | 0/96  | 0/96                              | n/a                                |
| 594-93           | S3   | 6120                          | 8/96  | 1/96                              | <0.0003                            |
|                  | <i>(1 amosite fibre found in the analysis)</i><br>Approximately 8um in length and 0.2um in diameter.     |                               |   |                                   |                                    |
| 595-93           | S4   | 3960                          | 8/96  | 0/96                              | <0.0005                            |
| 596-93           | S6   | 3461                          | 1/96  | 0/96                              | <0.0006                            |
| 597-93           | S6A  | 1687                          | 1/96  | 0/96                              | <0.0012                            |
| 598-93           | S7   | 4680                          | 0/96  | 0/96                              | <0.0004                            |
| 599-93           | S9   | 5040                          | 2/96  | 1/96                              | <0.0004                            |
|                  | <i>(1 crocidolite fibre found in the analysis)</i><br>Approximately 4um in length and 0.2um in diameter. |                               |   |                                   |                                    |
| 600-93           | P3   | 1080                          | 0/96  | 0/96                              | <0.002                             |
| 601-93           | P6   | 537                           | 1/96  | 0/96                              | <0.004                             |
| 602-93           | P9   | 999                           | 0/96  | 0/96                              | <0.002                             |
| 603-93           | Blank-(as per batch)   |                               | 0/96  | 0/96                              | n/a                                |

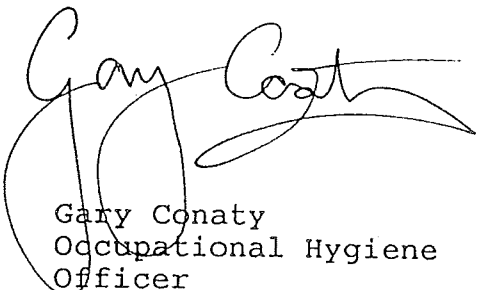
- \* (as recorded and reported by N.S.W. Department of Health)  
 \*\* (per equivalent number of Walton Beckett Graticule areas)  
 \*\*\* (The reported "less than" values have not been rounded off to 2 decimal places and 1 significant figure as required in NOHSC MFM.)



### Comments

Although we have used calculated values in the table, it is incorrect to report fibre counts below the practical detection limit of the method. For instance the reporting of one fibre in the analysis for the above sample would give approximately...0.0005 to 0.000007 fibres/mL. of air based on the sample volume range. This calculated value is not a real value and is statistically no different to zero fibres in the analysis. To arrive at a real value statistically above that of a zero or blank count, it is necessary to count as a minimum four fibres according to the theoretical (Poisson) distribution. In reality this gives an underestimate of the results found in practical laboratory comparisons where the detection limit is around eight to ten fibres. Any counts less than these values can be thought of as being in the "noise" band of a zero count.

The electron micrographs and EDAX spectra presented in appendix (A) show the typical fibres found in the samples provided. Standard spectra from UICC reference samples has been included in appendix (B) and low magnification micrographs of the samples displaying background particulate concentrations has been included in appendix (C).



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Occupational Hygiene  
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RESEARCH AND SCIENTIFIC DIVISION



Alan Rogers  
Senior Lecturer and  
Head of Occupational Hygiene

13th October, 1993.

## DRAFT GUIDELINES

### CONTAINMENT OF LOOSE ASBESTOS ROOF INSULATION IN PRIVATE HOMES

Contamination of a living environment with asbestos fibres is hazardous to health and the risk is dose related.

To minimise this risk in dwellings insulated with LOOSE asbestos materials, the following preventive measures are recommended:

- A. Containment of loose asbestos insulation material by effective and durable sealing or
- B. Total removal of loose asbestos insulation material, by licensed Asbestos Removal Contractor.

Both options have advantages and disadvantages, but complete removal of asbestos fibres is almost impossible to achieve.

Provided the asbestos does not become airborne, it may be left in place, however the following factors should be considered in order to contain loose asbestos:

1. The sealing of loose asbestos material must be complete and include cavity wall areas. The loose asbestos material may be covered with 200um thick plastic sheeting with all edges and joins adequately sealed. Alternatively the loose asbestos material may be impregnated with a suitable sealant. Any such work would be subject to the approval of WorkCover Authority and must be carried out by a Licensed Contractor;
2. All man-holes should be locked and sealed, and signs erected indicating the presence of asbestos;
3. All cracks in walls and ceilings should be sealed to prevent entry of asbestos fibres into the living areas;
4. Any wall or ceiling vents (external and internal) should be sealed, and any exhaust fans which discharge into the roofspace should be disconnected and sealed, or extended above the roof;
5. Any electrical, plumbing or other work in the roof space must be carried out by a qualified contractor, using the approved personal and respiratory protective equipment, and employing WorkCover approved practices.
6. No demolition or construction work shall be carried out until the asbestos has been removed by a Licensed Asbestos Removal Contractor.