Dear Mr. MacDonald,

Asbestos release from AIB

I refer to the recent outline test results of 18\textsuperscript{th} October from Graham at HSL regarding the above.

I contacted Graham who provided some further details of the sampling flow rates, chamber size and on the details of the AIB panel which fell down during the first set of tests.

Graham informed me that during the first set of tests he wore three samplers with flow rates of 10, 10 and 25 litres/min. During the second set of tests he again wore three samplers and the flow rates were 10, 10 and 3 litres/min. Graham commented that the results reported in his e-mail were the means of the results for the three samplers. Graham informed me that the volume of the test chamber was about 8 m\textsuperscript{3} and that he considered that the AIB panel had not been damaged by its fall in during the first set of tests.

I consider that the critical issue is whether or not fibres in the debris created by the insertion and/or removal of the drawing pins can be rendered airborne under the conditions which could be expected in a typical classroom situation.

To assess this aspect, I have analysed Graham’s results to determine the number of fibres collected on his samplers, as, by definition, the samplers could not have collected more fibres than were released from the AIB.

For the purposes of this analysis, I have assumed that the high airborne fibre concentrations measured during sitting and walking sections of the first test set were due to the disturbance and release of fibres from the debris caused by the drawing pin insertion and removal rather than due to the AIB panel having been damaged when it
fell, and that, as such, these results were still valid, although definitely higher than would have been observed if the panel had not fallen off the ceiling.

The initial analysis is summarised in Table 1

From the Table it will be noted that the samplers from the test with the chamber unventilated collected a total of about 1 million fibres and with the chamber ventilated collected about 35,000 fibres.

Given that during pin insertion and removal the sampling heads would have been about 500 mm away from the AIB and that when seated and walking about the sampling heads would have been about 900 mm and about 1500 mm respectively above the floor, the heads would have been inefficient at collecting fibres released directly from the AIB or off the floor as relevant, particularly when the chamber was ventilated. The fibres collected were therefore likely to have been present as airborne fibres released from the debris as it fell or was wafted about by airflows in the chamber rather than from fibres released from the debris by the action of sampling.

As noted above, the volume of the test chamber was 8 m$^3$.

During the first test set the flow rate through the chamber was 5.3 m$^3$/hr. That is, given the volume of the chamber, 8 m$^3$, and the flow rate through the chamber during the 75 minutes duration of the test, 6.6 m$^3$, the fibres were released into a total volume of about 14 m$^3$. During the second test set, the flow rate through the chamber was 149 m$^3$, and the fibres were therefore released into a total volume of about 157 m$^3$

Without knowing the details of the chamber layout as regards the relative position of the air inlets and outlets and of the relative position of the samplers worn by Graham and the air inlets and outlets on a minute-by-minute basis throughout the tests, it is not possible to back calculate the actual fibre emissions from the reported results.

However, it can be assumed that the samplers were very unlikely to have achieved more than about 5% efficiency, particularly during the second test set when the chamber was ventilated at about 13 air changes per hour. If a figure of 5% efficiency were assumed for the second test set, the total emission from inserting and removing 100 drawing pins would have been 23,000 x 100/5 = 460,000 fibres.

From Mark’s letter of Report of 20th August 2004, he assumed that 100 pin insertions and removals would generate about 3,000 “immediate” airborne fibres.

The results from the second test set therefore unambiguously demonstrate that the fibre emissions was a factor of 10->100 higher than assumed by Mark.

That is, Graham’s second series of tests clearly demonstrate that fibres released from debris were a more significant source of airborne fibres than those fibres rendered airborne from the AIB by the insertion or removal of pins.
It should be noted that the total fibre collection during the first test set and the above assumption of a sampler efficiency suggest that both my own and Graham’s tests which involved collection of the debris, with or without the cyclone, more correctly relate to the results of Graham’s second series of tests than Mark’s assumption that only immediately released fibres are of concern.

Any debris on the teacher’s body or clothing could constitute an on-going risk to the teacher throughout the balance of the school day and any debris on the classroom floor or other surfaces could constitute a risk to cleaners and janitorial staff.

It will be appreciated that in the real classroom situation, any fibres released into the classroom could have caused a risk for the children. Given the long life expectancy of kindergarten and primary school children, even a very low exposure can constitute a significant risk of developing mesothelioma 60, 70 or more years later.

Regarding the importance of agreeing a test protocol before starting any further work, if I had been consulted about the second series of tests I would have suggested that the test subject’s clothing and respirator be micro-vacuumed at the end of each test set to determine the number of fibres retained on these surfaces as, in the real classroom situation, any such fibres could have been disturbed and rendered airborne and could thus have constituted a hazard to the teacher and the children. In addition, I would have suggest putting samplers in front of the extraction inlet and sampling in such position throughout each test set so that total fibre emissions during the test could be determined. I would also have suggested sampling in from of the extraction inlet for 48 hours after each test as any airborne fibres released into the classroom would have constituted a risk until cleared from the classroom.

I should explain that I followed such a procedure during a study some years ago. This study involved the dry break-out and dry brush-up and bagging of the debris from a single 4’ x 8’ AIB panel. We got an equivalent collection of about 4x10^9 respirable amosite fibres during the removal and clean up and a further 10^9 fibres during post activity sampling.

I would stress that fibres from the debris generated by drilling into AIB will also be just as important as a source of risk as the debris is from the activity with drawing pins.

If have any queries regarding the above, please do not hesitate to contact me.

Yours truly,

Robin Howie

Copy: Mr. Michael Lees
TABLE 1: Analysis of results of second series of HSL tests on fibre release from insertion and removal of drawing pins

<table>
<thead>
<tr>
<th>Operator's Activity</th>
<th>Duration (min)</th>
<th>Chamber unventilated</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Fibre concentration (f/ml)</td>
<td>Total sampling Volume (ml)</td>
<td>Fibre collection (fibres)</td>
<td>Fibre concentration (f/ml)</td>
</tr>
<tr>
<td>Inserting and removing pins</td>
<td>25</td>
<td>0.06</td>
<td>1,125,000</td>
<td>67,500</td>
<td>0.04</td>
</tr>
<tr>
<td>Seated</td>
<td>20</td>
<td>1.1</td>
<td>900,000</td>
<td>990,000</td>
<td>0.02</td>
</tr>
<tr>
<td>Walking about</td>
<td>30</td>
<td>0.08</td>
<td>1,350,000</td>
<td>108,000</td>
<td>&lt;0.01*</td>
</tr>
<tr>
<td>Total/TWA</td>
<td>75</td>
<td>0.35</td>
<td>3,375,000</td>
<td>1,165,500</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Note: I have assumed a level of 0.005 fibres/ml for calculation fibre collection.