Action from paragraph 3.67 of WATCH/MIN/2006/1

Assessment of potential exposure of teachers and others from the use of drawing pins on asbestos (amosite) insulating board in a school classroom setting [WATCH/2006/2].

Paragraph 3.67 in the minutes of the 6th WATCH meeting (WATCH/MIN/2006/1) state:

The Chairman then invited the Committee to give some thought after the meeting to what WATCH would like to articulate with regard to other classroom personnel including children. Any suggestions could be provided in writing. He would then reflect back to WATCH the views received and thereby see if WATCH could reach a consensus position.

[ACTION: Members to think about what WATCH would like to articulate with regard to other classroom personnel including children and to send any such thoughts to the secretariat in writing.]

In this context two members provided the following contributions, to which members were invited to respond:

Contribution 1
Although no quantitative estimate of exposure of the children can be made, the following can be taken into account:

a) the close proximity of teacher’s breathing zone below the insertion point of the pin compared to that of the children [supported by presentations / comments of Robin Howie and Garry Burdett];

b) the low rate of re-entrainment of particles once settled [there were two or more references given at the meeting I think, one from Garry Burdett, although this may have arisen in the textured paint discussions];

c) a child who was directly below the pin insertion points would probably have a higher exposure than other children because of proximity to the work but it is understood that the teacher would insert the pins in various positions throughout the room so it is doubtful that one pupil would be selectively exposed because of such positioning; [Robin Howie had a picture of overhead work/breathing zone which supported premise].

d) most teachers spend longer than children in a junior classroom environment where drawing pins would be inserted into ceilings.

Hence it can be deduced that the cumulative exposure of others including the children is significantly less than that of a teacher.

Contribution 2
I fully agree with the WATCH member’s calculations in 3.42.

With further digestion I consider that it might be possible to assess the exposures of others in the classroom under the second of the member’s conditions.

If the teacher inhales at 20 l/min for 25 minutes, the total inhaled volume will be 500 litres. If it is assumed that the inhaled concentration is 0.05 f/ml, the teacher will have inhaled a total of 500 x 1,000 x 0.05 = 25,000 fibres.

From 3.15, the average of the range of total emissions from the second man-chamber test is about 20,000 fibres/hole, i.e. about 2,000,000 fibres would be emitted into the classroom from 100 pin insertions and removals. If the teacher has inhaled “only” 25,000 fibres, there would still be about ~2,000,000 fibres released into the classroom: some proportions of which would be inhaled by the teacher, the classroom assistant and the children, some of which would be cleared by ventilation and some of which would settle in the classroom.

Assuming, again from 3.15, an average of, say, about 3 air changes per hour, and assuming good mixing throughout the classroom, an arguably poor assumption, it could be expected...
that the number of fibres remaining in the classroom would decline by about a factor of 8 per hour, i.e. assume a factor of about 10 reduction per hour. That is, 2,000,000 fibres initially released would decline to about 200,000 after 1 hour, to about 20,000 after 2 hours etc.

The above figures can also be put into the context of Mark Piney’s about 200 m$^3$ classroom. Assuming uniform distribution, achieved by the teacher and children’s movements, the thermal gradients generated by the teacher’s and children’s bodies and heaters and by draughts, an initial emission of 2,000,000 fibres would give an initial average concentration of 0.01 fibres/ml, declining by about a factor of 10 every hour. That is, the actual exposure durations of the teacher, the classroom assistant and the children would substantially exceed the pinning time.

Note. This estimate exceeds by several orders of magnitude that initially produced by Mark Piney of HSE (see WATCH/2006/2 Annex 3).

Two responses were received:

**Response 1**
An overview of my impressions of the discussions by WATCH on this item:

1. There was a general agreement that there was potential for exposure to asbestos particles for all persons in the classroom.

2. There are now HSE guidelines that should ensure that future exposure to asbestos due to this practice (using drawing pins in asbestos-containing insulation board) will not occur.

3. There was a general agreement that the simulation experiments to measure the fibres released were difficult to design. The extent and level of the discussion are testament to this.

4. Despite the limitations of the simulation experiments conducted by HSL they did provide quantifiable values for fibre release and these values made sense to the members of WATCH.

5. There was general acknowledgement that any exposure to asbestos fibres was undesirable and potentially damaging to health. The progression from asbestos exposure to the development of disease is poorly understood with no clear understanding of the relative importance of the contributory factors.

6. Whatever the number of fibres released into the classroom environment by the practice it is impossible to have a retrospective quantification of the number of fibres that each person present inhaled, or the number of occasions that each person may have had an exposure, or what their cumulative exposure was.

7. It was not possible to derive any meaningful indication for risk to the individuals in the classroom, but this does not deny the general agreement that there was a potential for harmful effects due to the exposure to asbestos fibres.

**Response 2**
Whatever actually happened will never be precisely known. Likewise, as the recent House of Lords ruling confirmed, the presence of asbestos at one workplace cannot be accepted as the unique cause of a mesothelioma when there are other possible exposure sources. Professor Julian Peto also confirmed this on Radio 4 (4/5/06) when he said that until relatively recently (especially in terms of mesothelioma development), any member of the public could go to a DIY store and buy amosite based board and cut it at home to their heart’s content. However, we can make some general comments about what might have been likely, although we should be careful not to allow ourselves or anyone else to think that such comments can represent an accurate assessment of what actually happened.

With respect to Contribution 1:
a) the teachers breathing zone may have been close to the pin insertion point but if the person involved was aware that such an operation would cause release of dust I think it is likely that an intelligent person would aim to work at arms length rather than underneath the source of the dust thus substantially reducing the potential exposure.

c) No reasonable teacher would work above children, especially when working with sharp objects like drawing pins.

Agreed that the teachers are likely to have a greater potential cumulative exposure than children. However, whether that exposure is ever significant in health terms, is difficult to assess.

With respect to Contribution 2:

The model is "worst case". It assumes 100 pin insertions (per day? -hardly likely as the ceiling tiles would have become completely shredded in months). It assumes that all particles remain suspended rather than that they settle, which is inconsistent with point b) in Contribution 1. It assumes homogeneity in the air and an air change rate. None of these hypotheses has been tested.

Provided that these assumptions and their potential impact on the derived estimates are acknowledged, the estimates are reasonable for a worst case. Once again however, this gives us no real clue as to what the "real" exposures were for either child or teacher.

As we all know, the uncertainties here are so enormous that we must be careful not to endow our estimates with more integrity than they deserve.