Q&A

Personal Air Monitoring

As a source of competent advice to members, ARCA receives a range of enquiries on a broad spectrum of asbestos-related topics. Here we discuss some of the typical questions received relating to air monitoring, particularly testing that is not part of the 4-stage clearance process.

As part of our recent HSE licence renewal, we were asked to describe our personal monitoring strategy. We submitted a table of different material types and the percentage of these types of jobs where we would arrange for personal air monitoring. The assessing inspector wants further details. What else is required here?

It is quite common for a Licensed Asbestos Removal Contractor (LARC) to decide on percentages of jobs where personal monitoring will be arranged, depending on material type. However, this is a frequency, and on its own, falls well short of being a strategy.

A strategy is a plan of action that is designed to achieve a long-term or overall aim, and so requires significant forethought (i.e. planning) to determine what you want to achieve as your outcome. Consider the scenario where you have 3 operatives within an enclosure, all with differing roles associated with the removal of asbestos insulating board (AIB). The first operative is responsible for applying the dust suppressant to the surfaces and using the H-type vacuum cleaner to 'shadow vacuum' during the removal process. The second operative conducts the actual removal, and passes the waste directly to the third operative who immediately bags or wraps the waste. Your overall aim might be to conduct personal monitoring to determine which of these three activities gives rise to the highest airborne asbestos fibre concentration, with a view to adding further control measures to a specific activity should they be required.

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To achieve the aim, a LARC would need to consider:

- only engaging a UKAS accredited analytical organisation (or INAB in Republic of Ireland)
- communicating the date and time the monitoring is to take place to co-ordinate the monitoring with a particular stage of the work
- specifying clearly to the analyst which operative(s) will be subject to the personal monitoring
- conveying to the selected operative what their task(s) will be for the sampling duration
- communicating with the analyst the desired sampling duration
- ensuring the analyst comes prepared with a sufficient number of charged pumps to conduct the monitoring as instructed
- keeping an accurate record of what each operative was doing throughout the sampling period, to include finer details such as the pace of the work and the operative's proximity to the airflow
- ensuring that the sampling pumps are correctly worn throughout the sampling period
- ensuring analytical results are reported to yourself, regardless of whether the analyst is appointed by the client or not

By predetermining what you want your outcome(s) to cover, you can put a plan in place to achieve the desired outcome(s). Thus, you will be beginning to formulate a strategy for your personal monitoring, rather than just doing it because it needs doing. You will be doing it to find out as much as you can about what is going on during your removal job, and how you can learn from the findings to improve your future performance.

I understand about averages, but what is the significance of time weighted averages?

The logic in calculating a mean average of a set of figures doesn't apply when calculating time weighted averages (TWA). As the phrase implies, the time factor applies a 'weighting' to the calculated average.

If asbestos operative A, on site A, is carrying out a range of activities within an enclosure, we could take one personal sample over a 4-hour sampling period (and shift), and this would equate to a 4-hour TWA for that shift. In other words, there will be a certain number of fibres picked up on the sampling filter, which will give us a fibre concentration across the 4 hours for the range of activities that have been undertaken. In reality, the removal part of many asbestos jobs will be too short to allow 4-hour sampling periods, and this is where 4-hour TWAs get a little more complicated.

Operative B, on site B, might be undertaking exactly the same work as operative A, using exactly the same techniques and control measures, with the only difference being the size of the job and therefore the length of time spent in the enclosure. Although the airborne fibre concentration within the enclosure may be the same as on site A, operative B's personal exposure will be less than that of operative A, simply by virtue of spending less time within the working enclosure. If operative B spent 80 minutes in the enclosure (compared to operative A's 240 minutes), his exposure expressed as a 4-hour time weighted average would

Expressing personal exposures as 4-hour time weighted averages is how we would measure compliance with the 4-hour control limit detailed in the Control of Asbestos Regulations 2012. In the Regulations (see ACoP L143, Managing and working with asbestos), the control limit is defined as 'a concentration of asbestos in the atmosphere ... of 0.1 fibres per cubic centimetre of air averaged over a continuous period of 4 hours'. Should this figure be exceeded, despite the use of other control measures, employers must provide (and employees wear) suitable RPE.

For licensed asbestos removal work, 4-hour time weighted averages have limited relevance in most cases as suitable RPE is being worn anyway.

As a licensed contractor, would we be required to convert all of our personal monitoring data and exposure estimates into 4-hour time weighted average figures?

It would be useful to have some 4-hour time weighted averages (TWA) to be able to show compliance, though it should not be necessary to produce more than a representative number of values, providing these values are well within the protection factor of the RPE in use.

In addition, too much focus on comparing 4-hour TWAs can be misleading. In the example above, the 4-hour TWA for operative A will be three times the value for operative B. This may lead to thinking that operative A was not being as careful as operative B in removing the AIB, or perhaps the control measures weren't being applied correctly. The truth is that the airborne fibre concentrations generated by both operatives were the same – it's just the time factor that made the 3-fold difference, not poor technique that needs correcting.

How do we maximise the information we can get from our personal monitoring?

Time weighted averages (TWA) will not show any peaks and troughs in the amount of fibre that became airborne, such as would naturally occur if a range of different activities had been undertaken. One 4-hour sample, even though it could give us an automatic 4-hour TWA, doesn't provide us with much useful information for monitoring performance where a range of activities are being undertaken. For example, if we have a job removing AIB ceiling tiles, a 4-hour shift in an enclosure could be broken down into tasks, and if personal sampling were undertaken for each individual task, results could be illustrated as shown below:

Task	Duration	Measured fibre conc.
Removal of first four tiles where it is difficult to saturate tiles from above and difficult to prise off	0.5 hours	0.50 f/cm^3
Removal and bagging of remaining tiles where access is much easier	2.5 hours	0.16 f/cm^3
Fine cleaning prior to visual inspection	1.0 hour	0.03 f/cm^3

The 4-hour TWA for these tasks is calculated as follows:

$$\frac{(0.5\text{ hr} \times 0.50)+(2.5\text{ hrs} \times 0.16)+(1.0\text{ hr} \times 0.03)}{4} = \frac{0.25+0.4+0.03}{4} = \frac{0.68}{4} = 0.17\text{ f/cm}^3$$

In this example, a 4-hour sample would not show the variance in airborne fibre concentrations for the different tasks, whereas a series of shorter sampling periods covering each distinct activity would. The individual activities monitored with shorter sampling periods are referred to as 'specific short-duration activities' and by compiling a database of these, it will better enable you to see where your consistencies and inconsistencies are in your removal techniques. This in turn can lead to targeted improvements to your procedures, identify training needs of individual operatives, and to better inform your estimates when identifying anticipated fibre concentrations in your Plans of Work. Ultimately this should lead to reducing the spread of asbestos and the exposure to it to be as low as reasonably practicable – the two key requirements of asbestos legislation.

On the HSE licence renewal application form there is a question where the applicant is asked to describe their 'air and personal monitoring strategy'. What is meant by the 'air' part of this requirement?

The obvious answer is that this is referring to air monitoring other than personal monitoring. In reality, it would also not be referring to air monitoring conducted as part of the 4-stage clearance process, as this is covered elsewhere in the licence renewal application. Also, the air monitoring that is included in the 4-stage clearance process is mandatory for all licensed work within an asbestos enclosure, is so well prescribed, and with the singular aim of leading to the Certificate of Reoccupation it hardly warrants a strategy at all. It just needs to be done.

The remaining forms of static air monitoring can be applied as part of a strategy, and would address questions of who, what, when, where, why and how.

The typical forms of static air monitoring undertaken for specific purposes can be summarised as follows:

- Background sampling, to establish the prevailing airborne asbestos fibre concentration, usually carried out to establish a baseline before an activity that may lead to asbestos contamination
- Leak testing, to assess the integrity of an asbestos enclosure to ensure it is intact and that airborne asbestos fibres have not escaped
- Reassurance sampling, conducted in certain circumstances (such as following removal work) to confirm that residual airborne asbestos fibre concentrations are not elevated
- Near-source static sampling, to assess the release and spread of asbestos near sources, e.g. work without an enclosure, or disturbance of asbestos in soil
- Far-source/perimeter sampling, conducted around the perimeter of a site where there may be other workers, public access or residential and commercial buildings

Your strategy would include how you would select from the different forms of static air monitoring, what you would want to establish, and what you would do with whatever results are produced.