plan for air in as well as air out

We have received an increased number of enquiries over the past few months regarding HSE expectations with regards to air management calculations and enclosure design details within Plans of Work. These enquiries have been raised usually as a result of HSE comments received by members following site inspections or asbestos licence renewal assessments.

It is clear that as well as calculating how much air needs to be extracted from the enclosure, the HSE also wants to see the Plan of Work describe how the required volume of air will be allowed to enter the enclosure.

Allowing for the right amount of air to enter the enclosure is as important as ensuring the correct amount of air is extracted. If you haven't got the required amount of air entering the enclosure then you will not be extracting the required amount of air, even if the capacity of your negative pressure unit(s) suggests this.

For example, a well-sealed enclosure which requires 5,000m³/hr to be extracted to provide 8 air changes per hour, which has negative pressure units with a total capacity of 5,000m³/hr, and a standard size airlock and baglock which each have flap deflections between 200-300mm, and no other inlets for additional make up air, will probably only allow air extraction in the region of 3,000m³/hr. What can be extracted from the enclosure is limited by the amount of air which can physically be drawn into the enclosure.

When preparing Plans of Work, licence holders should consider how they are going to ensure sufficient make up air is permitted to enter the enclosure and how they are going to confirm the actual performance of the negative pressure units being used. *ARCA strongly recommends that the actual performance of negative pressure units on site is measured using an anemometer.*

Air Management

The specified level of air movement, or airflow, is 1,000m³/hr for small enclosures and at least 8 "air changes per hour" for larger enclosures. This has

been shown by HSE research to be the most reliable factor for good air management. Where this level of air movement is achieved, there is expected to be negative pressure of around minus 5 pascals, which represents good containment, thorough air mixing in the enclosure and, reduced exposure and spread of asbestos. It will also provide an easy method for determining that correct airflow exists, by using airlock door flaps as an indicator.

Planning

The first stage of planning air management for asbestos enclosures is to calculate the airflow required.

The effect of any ducting attached to the NPUs can be significant. As a "rule of thumb", ducting either side of the NPU, is likely to reduce flow by approximately 1% for each metre and 2% for each bend. Allowances for this need to be made in the calculation. For example, 10m of ducting will reduce the airflow of an NPU by approximately 10%, and 10m of ducting with two bends will reduce the airflow of an NPU by approximately 14%.

If there are any voids within the enclosure which will be opened up as the work progresses, the planning will need to consider these, and consider how the airflow will be increased to take account of the increase in enclosure volume and continue to maintain good air management.

In a well-sealed enclosure, the volume of air pulled out must be equal to the volume of air allowed in. In other words, where an enclosure has a series of NPUs intended to move 10,000m^3/hr of air, it must be designed to allow 10,000m^3/hr in. You will need to ensure that allowance has been made for sufficient make up air to enter the enclosure. The smoke test should confirm that the enclosure is well sealed. You should not rely upon a 'leaky' enclosure to supply make up air.

For planning purposes, NPUs should be referred to by their last known ***actual*** rating rather than the manufacturer's nominal rating. Standard units of measurement should be used throughout the organisation to minimise confusion: i.e., m^3/hr.

The planned air management system for an asbestos removal enclosure should be sufficiently detailed in the Plan of Work to enable the supervisor to set it up as required, and to test it to ensure it is effective and performing as anticipated.

1,000m^3/hr of airflow through an airlock will deflect a 'standard' door flap around 200mm. At 1,500m^3/hr, the amount of deflection, around 300mm, starts to restrict the space available for decontamination in the 'minimum' 1m square stage. These airlock flap deflections will be consistent for consistent flow rates regardless of enclosure size.

Standard Airlocks and Baglocks

To provide consistency to their approach, licensed asbestos removal contractors should adopt the standard sizes of airlock and air chambers identified by the HSE. Therefore, airlock and baglock door openings should be 0.7m x 1.7m, giving an aperture with an area of 1.19m^2.

The width and weight of the flaps are important. Wider, heavier flaps will offer more resistance to air.

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For the purposes of establishing good air management, 'standard flaps' should be 0.8m wide, "weighted" by rolling up excess 1,000-gauge polythene sheeting, which will weigh approximately 380g.

A 'standard' airlock or baglock will allow 1,500m^3/hr each into the enclosure. An enclosure with an airlock as the only opening into the enclosure will allow a maximum of 1,500m^3/hr into the enclosure before affecting the operative's ability to utilise the airlock as intended. If there is a baglock which is open, then that will allow another 1,500m^3/hr into the enclosure. It is permissible to have the airlock and baglock open at the same time to facilitate sufficient inlet air.

By using standard airlock sizes, flaps and flap weighting, as described, the airlock door flap deflection can be used to confirm that the planned airflow through the enclosure is being achieved and maintained.

Air Inlets and Pre-Filters

If air chambers are not practical due to site constraints, then filters can be cut into the enclosure wall to create air inlets.

The amount of air allowed in through a prefiltered air inlet is difficult to estimate. It is dependent upon the pressure difference between the inside of the enclosure and outside atmosphere, the size of the air inlet/filter and the filter medium. Almost every different size and make of filter will give differing values and therefore there is not a reliable method for calculating the amount of air a pre-filter will allow into an enclosure. However, the amount of air being supplied to the NPU(s) can be confirmed by checking the performance of the NPU using an anemometer, as air in equals air out. These air inlets should have flaps fitted on the inside of the enclosure which close when the NPUs are switched off or the pressure drops. You can confirm that air inlets are providing sufficient make up air by using an anemometer to check how much air is being extracted as air in equals air out.

For NPUs with fitted manometers, running the unit in free air, i.e., where air supply to the NPU is not restricted in any way, such as in an open space, will allow a reading to be taken from the NPU's manometer when the NPU is running at full capacity. Once connected to an enclosure, if the manometer reading has changed then the NPU will be being choked, i.e., sufficient make up air is not available to allow the NPU to function at its maximum. Additional methods of allowing air into the enclosure can be added until the manometer reading reads the same as in free air. You will then know that the NPU is working at its full capacity and an anemometer reading can confirm what that is.

Speed Controllers and Anemometers

Some NPUs are fitted with speed controllers to vary the airflow produced by the NPU. Care should be exercised when using these, as unless you have a way of accurately determining the NPU's actual performance, such as measuring it with an anemometer, you can be unaware of the actual airflow it is delivering. Simply turning the speed control down to achieve 200-300mm deflection of the airlock flaps will rarely mean that you have good air management.

Good air management planning requires knowledge of the ***actual airflow*** achieved by an NPU.

Site teams should establish the ***actual*** flow during set up, using an anemometer, if possible, and mark the airlock to show flap deflection with this amount of airflow. During the works, the flap deflection can be used as a reference point to determine that the airflow has not changed. The site team should be trained to do this and the Plan of Work or standard operating procedures should inform and instruct the site team as to what is required.

Further information can be found in the ARCA Guidance Note *"Air Management in Asbestos Enclosures"* which is available in the support section at www.arca.org.uk

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