

Using air quality monitors to assess the effectiveness of room ventilation.

Guidance for managers.



## 1. Assessing the effectiveness of room ventilation.

Suitable ventilation is an important factor in reducing the risk of COVID transmission because it reduces the amount of virus present in the air within enclosed spaces.

We can identify how effective room ventilation is by measuring the level of carbon dioxide in occupied rooms. When people breathe, they exhale carbon dioxide. If there is a continued increase in carbon dioxide levels within a room it may indicate the ventilation needs improving.

*HSE recommends using air quality monitors to help identify occupied areas of poor ventilation that may need further assessment of their use*

[HSE guidance for assessing ventilation](#)

This guidance will help Schools and Services identify areas which may benefit from installation of CO<sub>2</sub> monitors and provides information on best practice when operating and managing CO<sub>2</sub> monitors.

## 2. Type of rooms that would benefit from monitoring CO<sub>2</sub> levels.

Teaching, library and study spaces that are naturally ventilated may benefit from the use of monitors to provide assurance of the air quality within the space.

The types of area where CO<sub>2</sub> monitoring can provide an effective assessment of local ventilation include:

Room profile	Examples	Things to consider
Small naturally ventilated rooms <50m <sup>2</sup> ; consistent multiple occupancy > 1 hour.	small multiple occupancy study rooms/labs/meeting rooms	CO <sub>2</sub> levels can vary significantly due to individual breathing rates and be influenced by external factors. Results should be interpreted with care.

Medium spaces 50m <sup>2</sup> – 320m <sup>2</sup> ; high occupancy rates which may be consistent for long periods (> 1 hour) or high traffic over shorter periods.	Large teaching spaces/study areas/labs	Higher numbers of occupants provides more reliable measures of CO <sub>2</sub> level.
Spaces used for aerobic activities or enhanced aerosol generating activities	Indoor sports areas/performing studios/participant study labs.	
Large spaces >320m <sup>2</sup>	Lecture halls, conference venues, concert venues	Measurements taken in areas with high ceilings and large spaces may not be representative. Several sensors may be required to get a consistent assessment.

Air quality monitoring is **not** effective for areas that may be:

- Low occupancy e.g., 2 or 3 individuals
- Small spaces frequently used by a number of different people for short periods (high turnover areas).
- Large open spaces and areas with high ceilings
- Large spaces where occupancy varies frequently.
- Areas where HEPA air cleaners are installed – these reduce airborne transmission of the virus but still allow CO<sub>2</sub> to build up.
- Areas with known sources of CO<sub>2</sub> e.g., labs with incubator equipment, CO<sub>2</sub> compressed gas use, combustion sources.

### 3. Use the correct type of air quality monitor

Non-dispersive IR (NDIR) monitors should be used. Other types are not recommended. If you wish to install air quality monitors in your areas please contact [Facilities management, Hard Services](#) for details of the UoB approved models.

Mains powered monitors are preferred as this removes the need to frequently check and replace batteries. Where mains powered units cannot be installed then ensure you check the battery lifespan of any battery powered units; UoB approved models have a 5-year lifespan.

### 4. Installing air quality monitors.

- Monitors should be placed at least 50cm from people.
- Locate monitors at head height and away from windows, doors, and air supply vents.

## 5. How do we respond to the monitors?

The air quality monitors have visual display screens which are colour coded to indicate the level of CO<sub>2</sub> within the room. It is important to check with the supplier that the pre-set threshold levels are set to the following CO<sub>2</sub> concentrations.

Single 'snapshot' readings are not representative of the ventilation in a room; take several readings during an occupied period and use the average value to assess the performance of the ventilation.

Step	Status	Action for room users	Action for SSA/FM/LFM
1 (Green screen)	<800ppm CO <sub>2</sub> The space is well ventilated.	Ensure room is aired between users and whilst unoccupied.	No action required.
2 (Amber screen)	800ppm to <1500ppm CO <sub>2</sub>	<ul style="list-style-type: none"> <li>Open windows and non-fire doors to improve comfort.</li> <li>Ensure the room is aired between users and whilst unoccupied.</li> </ul>	No action required.
3 (Red screen)	Repeated levels >1500ppm CO <sub>2</sub> for 15 minutes or longer. Ventilation may need assessing.	<ul style="list-style-type: none"> <li>Open windows and non-fire doors to improve fresh air flow.</li> <li>Report to Maintenance Help Desk.</li> <li>Provide details of the number of people using the room and the activities being undertaken.</li> <li>Ensure the room is aired between users and whilst unoccupied</li> </ul>	<ul style="list-style-type: none"> <li>Monitor &amp; record ongoing CO<sub>2</sub> levels.</li> <li>If levels remain above 1500ppm or you receive repeated reports of high CO<sub>2</sub> levels, consider removing the room from use until it has been assessed.</li> <li>Maintenance Help Desk to log the report and information provided.</li> <li>Maintenance Help Desk to provide regular summary of reported incidents to FM and SSA.</li> </ul>

			<ul style="list-style-type: none"> <li>• SSA and FM or LFM (As appropriate) to review risk assessments to ensure room is suitable for the intended occupancy levels and activities being undertaken. Consider whether ventilation can be improved or whether other mitigations are required to improve air quality.</li> </ul>
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## 5. Maintaining and inspecting air quality monitors.

Campus Division will arrange the ongoing maintenance and inspection of monitors installed within centrally managed spaces. Schools should ensure that monitors they install in their locally managed spaces are similarly managed.

Schools must keep a register of any monitors they install and their location, this should be used to record inspections, any maintenance and incidents that result in repeated reports of high CO<sub>2</sub> levels.

Monitors need regular visual inspection to ensure they are operating correctly and to check the air quality levels within the room. Estates Assistants will carry out inspections of general teaching and study spaces whilst local technical teams should ensure monitors installed within their specialist facilities are inspected.

Battery operated units should be checked to ensure the batteries do not need replacing. Batteries should be replaced every 5 years or as recommended by the manufacturer.

Portable monitors that are connected to mains electricity via a plug and socket require PAT testing every 3 to 5 years.

UoB approved monitors use automatic baseline correction and do not require additional calibration.

Air quality monitors should be replaced every 10 years.

## 6. References.

- [Working Safely during Coronavirus \(COVID-19\): guidance from Step 4.](#)
- [CIBSE COVID-19 Ventilation Guidance](#)
- [HSE ventilation guidance](#)
- [Department for Education. HE Operational Guidance](#)

