

Policy and Sustainability Committee

10.00am, Tuesday, 30 November 2021

Update on Indoor Air Quality (Response to Motion)

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1. Recommendations

- 1.1 To note the work undertaken to date and actions underway, including the monitoring of indoor concentrations of carbon dioxide, to support the delivery of good levels of ventilation across the Council's property estate.

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Update on Indoor Air Quality (Response to Motion)

2. Executive Summary

- 2.1 This report has been prepared in response to a motion at Policy and Sustainability Committee on 3 August 2021 regarding Indoor Air Quality in Council buildings ([Minutes - Item 17](#)). The motion highlighted that there are significantly elevated risks of airborne transmission of Coronavirus SARS-CoV-2 within poorly ventilated indoor spaces.
- 2.2 An interim update was subsequently provided in the Business Bulletin presented to Policy and Sustainability Committee on [5 October 2021](#).
- 2.3 On 3 August 2021, the First Minister announced all schools and day care services must have access to CO2 monitoring. The Council has been implementing a plan to address this requirement, as well as reviewing indoor air quality in other settings. This report provides an update on this work.

3. Background

- 3.1 Ventilation has been a key focus of both Scottish Government guidance and the Council's operational management of buildings during COVID-19. As reported in the October Business Bulletin, and in support of improving ventilation in Council buildings, the Council engaged with Edinburgh Napier University in October 2020 to carry out a period of CO2 and temperature monitoring in representative building archetypes/uses across the Council's school estate. Monitoring was completed over winter and therefore provided the Council with valuable insight into the performance of representative buildings in the Council estate during winter.
- 3.2 Working with school management teams, local Facilities Management (FM) staff and the Council's maintenance contractors to evaluate ventilation levels in learning and teaching spaces, the following physical actions have been carried out:
 - 3.2.1 Repairs/adjustments/easing to existing windows, doors or screens to allow improved opening including new, repairs or replacement of ironmongery, restrictors, window winders as required;
 - 3.2.2 Repairs, accelerated maintenance/adjustments to extraction, ventilation, air handling, heating and controls systems, and

- 3.2.3 Additional surveys of specific individual school systems to check compliance.
- 3.3 Spaces have been assessed for ventilation and corrective action either taken or planned. This was informed by the outcomes of the CO2 monitoring across Council buildings in late 2020 early 2021 that identified risk areas for action and further feedback from CO2 monitoring following the distribution of monitors in April 2021. In addition, key areas of interest have been identified, such as sensory or break out spaces in schools, and targeted programmes of action are underway to record and monitor ventilation in these spaces.
- 3.4 On 3 August 2021, the Scottish Government advised that:
- 3.4.1 All schools and day care services for children must have access to CO2 monitoring, through either fixed or mobile devices, and that these should be used to assess the quality of ventilation in schools and childcare settings and identify any necessary improvements.
- 3.4.2 Assessments and necessary improvements to be identified by the October half term.
- 3.4.3 An additional £10 million would be made available to local authorities to support this work.

4. Main report

- 4.1 The motion presented to Policy and Sustainability Committee on 3 August 2021 requested the following:
- 4.1.1 An update for this Committee in one cycle on indoor air quality across the most heavily used buildings in the Council estate;
- 4.1.2 Data which has been recorded with an accompanying commentary covering the methodology used and observations so far; and
- 4.1.3 To indicate an acceptable range of carbon dioxide concentration, in line with the announcement of the Scotland's First Minister on 3 August 2021, to minimise risks of SARS-CoV-2 transmission in high use indoor Council settings.
- 4.2 Indoor air quality is determined by the concentration of pollutants in the internal environment. These pollutants can be produced from a range of sources either from inside the building or occurring externally and migrating indoors typically through ventilation. This report gives focus principally to CO2 in the internal environment and specifically in its role as a marker for both occupancy and the rate of air change within a space. In the context of SAR-CoV-2, the rate of air change is significant as it introduces fresh air into a space and, if there are SAR-CoV-2 viral particles, the subsequent dilution of contaminated air with fresh air lowers the risk of exposure.

Indoor Air Quality in High Occupancy Council Buildings

- 4.3 All Council schools received portable CO2 monitors in April 2021 to support the return of schools following the Easter break. A key driver for this was to provide assurance to school staff, as well as giving feedback on local ventilation strategies.
- 4.4 In line with the targets set by the Scottish Government in August 2021, a coordinated CO2 monitoring programme was undertaken across the Council's educational settings. In addition, CO2 monitors were provided to private registered childcare providers and to community centres to support re-opening.
- 4.5 CO2 concentrations in the built environment will vary depending on occupancy levels and the rate of fresh air entering a space. CO2 can build up over time and is unlikely to be static during occupation. The Council's approach has been to use CO2 monitors to help evaluate current ventilation strategies, as well as identifying areas of potential risk. In most spaces, CO2 levels have been found to be below the upper limits advised by the Scottish Government. Where higher levels of CO2 have been identified, the first step has been to look at local controls such as increasing window opening. And, in some instances, works have been undertaken such as to free previously sealed windows or improve opening of windows.

Recorded Data, Methodology and Observations

- 4.6 The CO2 monitors provided to schools and other key buildings log CO2 concentrations at intervals ranging from two to 10 minutes. In addition, the monitors also record temperature, humidity and air pressure. Data logs are accessed by linking the CO2 monitor to school iPads via Bluetooth. The monitor has an associated IOS application that facilitates analysis of CO2 data. It is also possible to download logs in CSV file format. The CO2 monitors have a digital display and therefore readings can also be recorded directly from the device.
- 4.7 Observations from CO2 monitoring include that:
 - 4.7.1 Ventilation levels, evidenced from indoor CO2 concentration recording, were generally complying with guidance;
 - 4.7.2 Cross ventilation is important and windows across a space should be opened to encourage higher levels of ventilation;
 - 4.7.3 Windows and doors can be opened fully periodically to 'flush' room air between occupation; and
 - 4.7.4 During winter, increased ventilation can have an adverse impact on air temperature in spaces.

Acceptable Range of Carbon Dioxide Concentration

- 4.8 The Council follows Scottish Government guidance on CO2 concentrations. This states that '*the most recent scientific advice and research is that an upper level of 1500ppm should be used to identify and prioritise multi-occupancy, regularly-used areas for improvement*'. In addition, '*where there is likely to be an enhanced aerosol generation rate (e.g. loud singing/drama, indoor PE when permitted) should*

aim to ensure ventilation is sufficient to maintain CO2 concentrations at lower levels (a figure of 800ppm is provided).'

- 4.9 Whilst this guidance has been framed around educational settings, the same limits have been used when considering other buildings across the Council's estate. However, it should be noted, that as CO2 is linked to occupancy, it is a less effective marker for ventilation rates in low occupancy or large volume spaces.

5. Next Steps

- 5.1 From the work carried out to date, a clear risk factor is how local users approach ventilation in an individual space. This is particularly critical in spaces that rely on natural ventilation.
- 5.2 The Council recognises that short term monitoring provides limited assurance over longer term ventilation levels, particularly where a balance needs to be struck between ventilation rates and thermal comfort. The Council will continue to consider the risks presented and to support an informed and comprehensive CO2 monitoring approach to provide assurance over ventilation strategies during COVID-19.
- 5.3 In line with Health and Safety Executive (HSE) and Scottish Government guidance, a ventilation-based approach is prioritised over the use of air cleaning and filtration units. Current guidance points towards air filtration units being an option for consideration in areas where ventilation cannot be improved. This is something that the Council continues to review. In [recently published guidance](#), the Chartered Institute of Building Service Engineers advises that: *'There is currently limited evidence that air cleaners are an effective control measure to prevent COVID-19 spread, however the principles of air cleaning suggest that they may be useful in some cases'*.
- 5.4 The Council is building on its earlier collaboration with Edinburgh Napier University, and is supporting PhD research with two Council schools taking part in a CO2 monitoring project. In one school air quality monitors with digital display will be installed in all classrooms, and in the other school a logger with non-digital display will be installed. The focus will be to understand the impact of feedback in influencing ventilation levels in naturally ventilated buildings.

6. Financial impact

- 6.1 To date, the Council has spent £124,800 on CO2 monitors.
- 6.2 The Scottish Government has announced £10m of funding to support CO2 monitoring across Scotland's school estate.
- 6.3 The overall quantum of funding that will be distributed to local authorities is:
- Capital £6.63m; and
 - Revenue £3.00m.

- 6.4 The remaining balance of the £10m is earmarked for the Private, Voluntary and Independent (PVI) sector.

7. Stakeholder/Community Impact

- 7.1 The Council's approach to ventilation and subsequent CO2 monitoring has been developed in discussion with service area representatives and Trade Unions. In addition, guidance and training has been provided to local staff, including head teachers and business managers.

8. Background reading/external references

- 8.1 [Policy and Sustainability Committee, Tuesday 3 April 2021, Business Bulletin](#)
- 8.2 [Scottish Government, Coronavirus \(COVID-19\): guidance on reducing the risks in schools](#)
- 8.3 [Health and Safety Executive, Ventilation and air conditioning during the coronavirus \(COVID-19\) pandemic](#)
- 8.4 [Chartered Institute of Building Services Engineers, COVID-19: Air cleaning technologies](#)

9. Appendices

- 9.1 None.