To: Connecticut Committee of Education

From: Erika Scheffer, Associate Director, Government Relations, Carrier Corporation

Date: [March, 14, 2023]

Re: Raised Bill 1198: An act implementing the recommendations of the school indoor air quality working group.

Dear Co-Chairs Currey and McCrory,

On behalf of Carrier, the leading global provider of healthy, safe, sustainable, and intelligent building and cold chain solutions, **we support with amendments Raised Bill 1198.**

HB1198 requires uniform inspections and evaluations of indoor air quality (IAQ) and heating, ventilation, and air conditioning (HVAC) systems in school buildings performed by approved personnel, on set frequencies, to be completed and then properly reported to designated parties.

Thank you to the sponsors of this bill for taking action to improve the health and safety of students, teachers, and staff by requiring uniform inspections and evaluations of IAQ and HVAC systems that include recommended corrective actions that schools can take to improve indoor air quality (IAQ) within Connecticut schools. Enhanced air quality within indoor learning environments can both support reduced transmission of airborne illnesses, including COVID-19[1], and improved educational outcomes.[2] IAQ solutions typically include HVAC equipment or controls upgrades to improve and manage air ventilation and filtration, and as of 2021, 41% of districts "required HVAC systems upgrades or replacements in at least half of their schools"[3]. Assessing the current state of IAQ in schools and acting on recommendations is a critical step to making learning environments healthier for all students.

We recommend the following amendments to improve the feasibility of meeting bill requirements for schools and ensuring the improvement of indoor air quality in schools over time:

Section 3.2 (Lines 138-168)

- Line 138: We recommend that indoor air quality assessments be performed every one to two years at a minimum, instead of every three years. Indoor air quality can change based on varying occupancy quantities, equipment performance, and even outdoor air quality. As a result, to ensure air quality consistently meets standards, we recommend more frequent assessments. An alternative option to annual indoor air quality assessments, is to complete HVAC assessments annually and complete indoor air quality assessments every three or four years. This alternative approach is less effective and less accurate but also less expensive.
- Line 146A: We recommend that air temperature and humidity be included in inspections and evaluations to assess HVAC system performance.
- Lines 146-147B: We recommend inspecting for radon and other hazardous pollutants in the air, including ozone and carbon monoxide.[4]
- Lines 148-150D: We recommend including CO_2 in addition to volatile organic compounds to be assessed as it may be an independent concern for indoor air quality.[5]

- Line 150: We recommend including $PM_{2.5}$ to be assessed as it is widely recognized to be harmful to health.[6,7]

Section 3.3 (Lines 169-227)

- Line 169: We recommend that HVAC assessments be performed every one to two years, instead of every five years. HVAC equipment performance contributes to indoor air quality in schools. As school occupancy and environmental conditions change, operating parameters may need to shift to maintain desired indoor air quality levels. As a result, to ensure air quality consistently meets standards, we recommend more frequent assessments. An alternative option would be to continuously monitor school building IAQ using sensors and rely on notifications to alert operations staff when IAQ falls out of approved ranges, so they could then take corrective action to improve IAQ.
- Line 178: We recommend clarifying the language "testing to determine maximum filter efficiency." If the intent is to determine the maximum filter efficiency that the air handler can support due to resistance-to-airflow (pressure drop) limitations, a better requirement might be "testing to determine the maximum filter pressure drop permitted at maximum (or rated) operating air flow rate." Filters could be then chosen and changed based pressure drop, selecting the highest efficiency filter possible within the measured pressure-drop constraints. On the other hand, if the intent is to test the effectiveness of the filters chosen by the school, then the appropriate text would be "testing to determine minimum filter efficiency", since filter efficiency will vary over the life of the filter. Information for such a requirement should be available from filter manufacturers and wouldn't necessarily require additional testing, however. The appropriate test would be ASHRAE 52.2, including the optional Appendix J conditioning step."
- Lines 186-187G: We recommend clarifying if carbon dioxide sensors are required by schools to install or if "verification of CO_2 sensors" is only required if schools have independently decided to invest in them separate from this program. If they are not required for schools, we suggest the program verify not only CO_2 sensors, but also indoor air quality sensors schools may have invested in as well. This would require schools be given an indoor air quality standard for acceptable ranges of pollutants in addition to CO_2. If CO_2 sensors are required, we recommend air quality monitors be used to track indoor air quality as opposed to CO_2 only monitors. CO_2 tracking alone does not measure overall indoor air quality. CO_2 may be an air pollutant in its own right and can be used to infer the air ventilation rate relative to CO_2 sources within an indoor space;[8] however, more comprehensive indoor air quality measurements would include the concentration of multiple pollutants in the air including (but not limited to) VOCs, $PM_{2.5}$, and radon, as well as temperature and humidity in addition to CO_2.[4] Choosing a sensor which considers air quality metrics in addition to CO_2 better enables schools to take the right actions to improve IAQ and realize the full scope of IAQ benefits, which can include cognitive function.[9] In addition, while tracking indoor air quality, it is recommended to also track changes to school GHG (greenhouse gas) emissions and energy consumption resulting from ventilation assessment recommendations to understand the environmental impact of increased ventilation and inform the optimal selection of potential IAQ solutions.

Section 5: We recommend additional IAQ regulations be required in addition to temperature regulations. While an industry-accepted school or education specific IAQ standard does not exist, there are existing IAQ standards that can be referenced in the meantime including ASHRAE, WELL, or Carrier Certified Healthy Air Systems standards. We recommend standardizing to what is available now instead of waiting for a standard to be published to begin improving holistic indoor air quality in schools sooner. An alternative would be to develop a school specific IAQ standard for Connecticut using a committee of IAQ experts and community representatives. For example, Maryland is exploring creating its own IAQ standard for public buildings through HB900.

For these reasons, we support Raised Bill 1198 with amendments.

Sincerely,

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Citations

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