



FALL VIRTUAL CONFERENCE

S2.6: Experimental Study on Classroom Ventilation to Mitigate Viral Transmission

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ABSTRACT

With schools opening under the current COVID-19 pandemic situation, it is urgently required to improve classroom HVAC (Heating, Ventilation, Air Conditioning) systems in order to prevent viral transmission between the occupants in the classroom. However, since current HVAC systems have been designed to focus on outside contaminant infiltration, thermal comfort, and operation energy savings, it is not adequate enough to prevent the exposure to the airborne viral contaminants and minimize the viral transmission between the occupants inside. In this research, we investigated (1) indoor airborne contaminant decay to optimize the HVAC operation conditions and (2) spatial distribution of droplet particles from a teacher to students in order to minimize the viral transmission. Indoor contaminant decays were measured at the center of a test classroom under various HVAC operation conditions and the decay rate is strongly dependent on the clean air supply rates from AHU (Air handling unit) and CADR (Clean air delivery rate) of air cleaners and/or FCU (Fan coil unit) in the classroom. The experimental results were used to validate an analytical modeling and the decay modeling is publicly accessible from the CFR (Center for Filtration Research) website at <https://cfr.umn.edu>. Spatial contamination distributions were also measured using multiple air quality monitors to investigate droplet spread profiles with various HVAC operation conditions which simulate viral transmission from a teacher to students in a classroom via spit droplets. The results show that it is critical to have the HVAC flow direction against the teacher's location with higher HVAC flowrates and eliminate ventilation air dead zones in the classroom to mitigate viral transmission from a teacher to students.