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Simulating exhaust flows on a building rooftops

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Indoor air quality is an important factor to consider when designing HVAC systems. The health and safety of those who occupy the space within any structure could be significantly affected by the air handling system inadvertently recirculating dirty exhaust air, or capturing exhaust from neighboring structures. And thus, the design and placement of intake and exhaust structures on building rooftops must be thoroughly evaluated. When evaluating the intake and exhaust structures on building rooftops, it is important to collect and consider as much information as possible. This may include building dimensions, structures on the rooftop, the dimensions of neighboring buildings in addition to their ventilation specifications, and environmental factors such as temperature and wind direction. This paper reviews the concept of using simulation software to model the likelihood of exhaust gases recirculating through intake structures on building rooftops. Each of the simulations consisted of a rectangular building with an intake structure and exhaust stack in various positions on the roof. ASHRAE stack design guidance, provided in chapter 45 of the 2011 *ASHRAE Handbook*, was used to develop these cases. Exhaust gas of various velocities is simulated to identify whether modeling techniques can serve as an adequate replacement or alternative to traditional ASHARE based hand calculations. A properly designed exhaust structure would result in minimal exhaust gas recirculation. In other words, a case in which the exhaust gas travels over the recirculation zone that is adjacent to the intake structure and is carried beyond the building.

Biography

Daniel Woodard is pursuing his Master's degree at the University of Alabama at Birmingham (UAB) in the School of Mechanical Engineering. He received his undergraduate degree from UAB, which included coursework focused on HVAC applications and computer simulations. He has been a member of ASHRAE since 2010.

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