Abstract

This thesis project presents a methodology for analyzing the performance of a laboratory exhaust system. The methodology is applied to the analysis of the laboratory exhaust fan sets at Cooper Union's 41 Cooper Square academic building. Firstly, the design airflow rate of the exhaust fan sets were compared to the airflow rate ranges presented in the approved catalogs of the products to determine whether the system complies with ANSI/AIHA Z9.5 Standard and the 2015 Uniform Mechanical Code. Secondly, a method to verify the setpoints in the Building Management System (BMS) is proposed. By analyzing the structure of the ducts serving each lab, the range of the airflow rates for each lab under different static pressure conditions can be found. By comparing the calculated range to the desired airflow rate for each lab, proper values for the static pressure setpoints can be found. Thirdly, the code for the BMS was compared to the Sequence of Operations to determine whether the current BMS is functioning as intended. Lastly, a system inspection protocol for building engineers to troubleshoot the exhaust system is proposed. The protocol proposes regular system inspections and maintenance that should reduce the occurrence of equipment failures and reduce the energy wasted by helping building engineers quickly identify and fix issues. The methodology presented in this thesis research lays the foundation for evaluating and optimizing the exhaust fan system operation and ventilation performance based on the size and use of the laboratory spaces.