EE 27:
REDUCE LEAKAGE FROM AIR DUCTS

New York City Mechanical Code
Proposal developed by the Energy & Ventilation Committee

Summary

Issues:
Energy is wasted when air ducts leak and vents are improperly adjusted.

Recommendation:
Test and seal all ventilation ducts, and adjust vents in new construction or renovations.

Proposed Legislation, Rule or Study

Amendments to the New York City Mechanical Code:

1. Delete Section 403.3.4 and add a new Section 403.3.4 as follows:

   **403.3.4 Testing, adjusting and balancing.** Ventilation systems shall be tested and balanced in accordance with procedures in one of the following standards:

   1. AABC National Standards for Testing and Balancing Heating, Ventilating and Air Conditioning Systems, or

   2. NEBB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems, or


2. Amend Section 603.9 as follows:

   **603.9 Joints, seams and connections.** All longitudinal and transverse joints, seams and connections in metallic and nonmetallic ducts shall be constructed as specified in SMACNA HVAC Duct Construction Standards—Metal and Flexible and SMACNA Fibrous Glass Duct Construction Standards or NAIMA Fibrous Glass Duct Construction Standards. All longitudinal and transverse joints, seams and connections shall be sealed in accordance with the Energy Conservation Construction Code of New York State. Ducts concealed in shaft enclosures extending three or more floors shall be leak-tested in accordance with SMACNA HVAC Air Duct Leakage Test Manual, and the rate of air leakage (CL) shall be less than or equal to the established criteria set forth in the manual.

3. Amend Chapter 15 to include the following standards:

   AABC National Standards for Testing and Balancing Heating, Ventilating and Air Conditioning Systems

   NEBB Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems


Supporting Information

Issue – Expanded

Just like dripping water faucets, even small duct leaks factored over time can add up to substantial cost and wasted energy. Likewise, unbalanced ventilation systems can make conditions uncomfortable for occupants. Recognized national industry standards can ensure that mechanical systems are constructed and operate in accord with their design.

It is particularly important to test vertical duct risers prior to closing in building shaft walls. Unlike ductwork in dropped ceilings that can be readily inspected and repaired, the only opportunity to fix leaks in most vertical duct risers will be during construction. Once concealed behind walls, vertical ducts may leak for the life of the building without ever...
being detected. Even if the leaks in vertical risers are caught, the cost to remove and reinstall the shaft enclosure means the leaks will probably not be repaired. Testing ducts extending three or more floors during construction and prior to shaft wall construction would facilitate inexpensive repair and provide the quality assurance that ducts in the shafts are properly sealed.

Ventilation systems can also suffer from poor balancing. Some systems over-ventilate certain rooms, making them drafty, noisy, and overheated or overcooled, while under-ventilating others, making them stagnant and under-heated or under-cooled. Poorly balanced systems are inherently wasteful. The Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) has established standards for the testing and balancing of ventilation system. Using this standard provides quality assurance that the balancing process was performed in a reliable and repeatable method.

Environmental & Health Benefits
This proposal will improve indoor air quality by ensuring that the air quantities calculated by the design engineer to provide health and comfort and shown on the contract documents are actually realized in the field. The building code requires minimum ventilation (outdoor air) rates to offset the oxygen intake and carbon dioxide (CO2) discharge that occurs through the breathing process. When these rates are not achieved due to improper balancing or duct leakage CO2 concentrations can build up in occupied areas leading to poor indoor air quality. Pollutants generated in the indoor environment cannot be adequately diluted or flushed out if the space doesn't receive proper airflow.

This proposal was found to have a high, positive environmental impact per building and to impact a small number of buildings. It was thus given an environmental score of 2.

This proposal was found to have a positive, indirect health impact.

Cost / Savings
As described in the Executive Summary, Bovis Lend Lease prepared cost estimates for each Task Force proposal in the context of well-defined construction projects in specific buildings. Where possible, members of the Technical Committees prepared savings estimates for some of these projects and buildings. These cost and savings estimates are presented in the February 1st draft version of Appendix A. The innate uncertainty in how construction and operation will vary from one building to another, the complexity of the Task Force proposals, and the wide range of applications in which the proposals may be realized mean these figures are truly estimates.

This proposal was estimated to increase first capital costs by 0.0% to 0.07%, depending on building type. It was thus categorized as incurring no to a medium capital cost increment. This proposal was also estimated to generate financial savings that will pay for the capital costs in less than three years depending on the building type.

Precedents
Precedents for this proposal include California's Energy Efficiency Standards for Residential and Nonresidential Buildings. Established in 1978, these codes were a response to a legislative mandate to reduce California's energy consumption.

LEED
The LEED commissioning process is intended to verify that the project's energy-related systems are installed, calibrated, and perform as intended. Projects that have been tested according to the measures outlined in this proposal will more easily comply with the following LEED prerequisites and credits:

• LEED NC-EA prerequisite 1, Fundamental Commissioning
• LEED NC-EA cr. 3, Enhanced Commissioning
• LEED CI-EA prerequisite 1, Fundamental Commissioning
• LEED CI-EA cr. 2, Enhanced Commissioning
• LEED for Schools EA prerequisite 1, Fundamental Commissioning
• LEED for Schools EA cr. 3, Enhanced Commissioning
• LEED EB-EA prerequisite 1 Existing Building Commissioning
• LEED EB-EA credit 3.1, 3.2, & 3.3 Building Operations and Maintenance

For adherence with LEED E&A prerequisites and credits, a Commissioning Authority (CxA) must be assigned to oversee the commissioning process. The CxA will be ultimately responsible to verify the performance of systems for the purposes of LEED certification.

Since indoor air quality may be improved by ensuring that air flows according to the building engineer’s design, this...
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Proposal may also facilitate achieving the following credits:
• LEED NC-EQ cr. 3.1 & 3.2 Construction IAQ Management Plan;
• LEED CI-EQ cr. 3.1 & 3.2 Construction IAQ Management Plan;
• LEED EB-EQ cr. 3 Construction IAQ Management Plan;
• LEED for Schools EQ cr. 3.1 & 3.2 Construction IAQ Management Plan;
• LEED for Homes EQ cr. 8 Contaminant Control.

To earn credits under the LEED 2009 rating systems, during construction projects must meet or exceed the recommended Control Measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3). Since the measures outlined in this proposal do not make reference to this specific standard, project teams must research to verify LEED compliance for projects.

Implementation and Market Availability
There are no known implementation issues for this proposal. Testing, Adjusting and Balancing contractors are readily available.

ENDNOTES:

2 SHEET METAL AND AIR CONDITIONING NATIONAL CONTRACTORS ASSOCIATION, IAQ GUIDELINES FOR OCCUPIED BUILDINGS UNDER CONSTRUCTION, ch. 3 (2d ed. 2007).