

# Why HVAC Certification for Balancing and Commissioning Contractors is Necessary for Ventilation Measurement, Verification, Validation and Decreased Energy Consumption

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## ABSTRACT

This presentation will make the audience aware of the importance of ISO-recognized certification programs in the testing adjusting and balancing and commissioning of HVAC systems. Important ISO 17024 standards will be covered as well as their importance. Many faults have been found in existing testing adjusting and balancing and commissioning certification programs ranging from conflicting issues within the organization and their testing procedures; political control over the process; inconstant certification methods; geographical differences. These and other topics will be covered relating to certification process. The defining lack of variance in following an ISO standard and inventing one's own industry rules or and arbitrarily determining one's own industry rules will be covered. Existing legislation in the United States requiring certification on HVAC testing adjusting and balancing will be covered. The identification of problems on balancing reports such as erroneous numerical values, impossible readings and recordings of values will be covered with emphasis on how to identify these problems at a glance. The attendees will examine and review actual balancing reports to see these differences for themselves in order to be able to recognize these issues/problems in future reviews of HVAC balancing reports. The fast pace of Green Buildings LEEDS, and Green Globe have left many growing pains in the buildings being built without tuning the HVAC system to peak efficiency. Attendees make a green building green and that a LEEDS building is delivering the proper ventilation rates as opposed to buildings that do not have proper ventilation rates, thus leading to IAQ problems for owner and occupants of those buildings. The difference between a building which has had its HVAC properly tested, adjusted and balanced and those without proper analysis/treatment will be covered in detail. Attendees will be shown how radically different the energy costs can be between the two types of buildings. Difference between a building which has had it HVAC properly tested adjusted and balanced and ones who's has not been properly tested adjusted and balanced will be covered and shown how radically different energy cost can be between the 2 buildings.

## KEYWORDS

HVAC, Certification, IAQ, Green Buildings, LEEDS, Energy, Efficiency, Commissioning, Ventilation

## **ISO/IEC Standard 17024**

Not only is certification an important requirement for companies doing the testing, adjusting and balancing of heating, ventilating and air conditioning systems, it is equally important that those companies are certified by an organization that follows ISO/IEC standard 17024 to ensure that the balancing of the HVAC system is done properly.

ISO/IEC 17024 specifies requirements for a body certifying persons against specific requirements, including the development and maintenance of a certification scheme for personnel.

ISO 17024 was developed to alleviate many problems associated with certification bodies. The first requirement of ISO 17024 is to have a board of directors that is equally balanced. One way of meeting that requirement is to have the same number of people representing both sides of business; this includes both labor and management. The next factor of great importance following ISO standard 17024 is the need to have different entities providing specific parts of the certification process. This can be obtained by partnering with others to qualify for ISO standard 17024 requirements; for example, one entity trains individuals while a second entity provides testing for individuals and a third party provides the certification process and certification for ISO. ISO standard 17024 also requires many conflict of interest policies such as instructors are not able to administer any exam for certifications. ISO standard 17024 additionally requires that individuals performing exams, whether giving exams or grading exams, cannot be local competitors of the proctors or examinees. This means that an existing contractor cannot politically fail a future competitor on their exam. All exams given under ISO standard 17024 are ensured to be free from local politics by not allowing individuals to be treated differently rather than by equal standards. When following ISO standard 17024, all certification processes are required to be documented and following a existing standard rather than arbitrarily making up rules that fit nicely for the organizations providing certification.

## **Review of Current State Legislative Activity to Address Indoor Air Quality in Schools**

As stated above, the general population has little awareness of good or bad IAQ. This raises the question of how much the public should be expected to know about the subject and how the general public is expected to use this knowledge. Should school administrators, with limited resources, be adequately prepared to deal with testing and adjusting the IAQ in their school buildings? If not school administrators, then who can be expected to test and maintain proper ventilation rates and IAQ within our nation's school buildings?

Following is a look at what a number of states around the country are doing to address the IAQ situation in their public schools. The regulations adopted by each state tend to contain ambiguous language and differ in the level of focus from one state to the next. (See Appendix A)

### **Testing Adjusting and Balancing Bureau**

The Testing, Adjusting, and Balancing Bureau (TABB) was developed by the National Energy Management Institute Committee (NEMIC) as a not-for-profit corporation sponsored by the Sheet Metal Workers' International Association (SMWIA) and the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA). TABB runs the TAB (Testing, Adjusting, and Balancing) Certification Program to train and provide qualified professionals who ensure that HVAC systems operate at the highest standards and with the greatest efficiency and effectiveness at every stage of a system's lifecycle (TABB website, 2006).

TABB certified technicians must have experience in the testing, adjusting and balancing field. This requires experience in the testing of how much air flow is actually in a duct system compared to how much air flow the engineer has designed to flow through the duct system. This experience also includes testing of water flow systems. The testing, adjusting and balancing technician also tests the actual water flow through a piping system and compares it to the water flow the engineer has designed to flow through that piping system.

Balancing is a term used to describe the act of comparing the collective flows, including the consideration of how changing the flow rate in an air duct or water piping system will affect the other ducts or pipes within those systems. Adjusting is the term that describes the actual moving of dampers and valves to change the flow of air or water within an air duct or water piping system. The TABB certified technician must pass a five-hour written exam and a 16-hour practical exam on both air duct systems and water piping systems to become a certified technician. TABB certified contractors must use properly and currently calibrated equipment, have all of the education and resources available to balance a system properly, employ at least one TABB certified technician and have the appropriate experience in the field of testing, adjusting and balancing of HVAC systems. A number of other prerequisites are noted on the TABB Contractor Application Checklist (See Appendix A).

### **Green Building LEEDS**

The fast pace of Green Buildings LEEDS and Green Globe have left many growing pains in the buildings being built without tuning the HVAC system to peak efficiency. The US Green Building Council (LEEDS) does not have a requirement for certified testing and balancing contractors or for certification of

technicians performing the work on HVAC systems. Many times a requirement for certification of a contractor can eliminate IAQ and ventilation issues which have risen in Green Buildings.

## **HVAC Systems Testing Adjusting and Balancing**

The need for balancing a HVAC system is obvious to many engineers as they know why an HVAC needs to be balanced. When HVAC systems are built, duct sizes are calculated and then changed to fit into normal building practices. For example, if an engineer determined that a 23 1/4" round duct was needed, the engineer would increase that size to the nominal size of 24 inches. Installing a balancing damper in the duct compensates for this additional increase in duct size. This allows for a balancing professional to increase the ducts static pressure to mimic the same resistance as the original 23 1/4 inch round duct. This happens on almost every HVAC duct in a building that needs a proper balancing procedure and qualified individuals to perform this work. When this work is not done properly, the system is not tuned to its highest possible energy performance. To obtain the design air flows; many times the HVAC system requires fan and or motor change-out to accomplish design quantities of air. This is particularly energy inefficient because to deliver twice the air out a duct the static pressure in the duct needs to be increased by 4 times, and 8 times the electricity is required to double the air flow.

## **Appendix A**

### ***State of Georgia***

Georgia House Bill 718 uses ambiguous language such as "testing of air quality to the extent necessary to ensure healthy indoor air quality" and "to address any significant problem regarding indoor air quality" (State of Georgia House Bill 718, Sections 1 and 2, 2001). These words sound good but can have a different meaning to each person who tries to apply the law. Who decides the "necessary extent of healthy indoor air"? What is a "significant problem"? How can a law be effective when it is not quantified with specific engineering figures or formulas in regard to regulating IAQ? If we were to write a law that called for the need to have a room warm, how would it be enforced? What would warm mean?

### ***State of Indiana***

A successful law adopted in Indiana (Indiana House Bill 407) quantifies Indiana school IAQ by having selected experts in the HVAC industry determine criteria for good IAQ and providing standards on how to solve IAQ issues. Indiana has taken very proactive measures to accomplish good IAQ in schools by using

industry experts in the implementation of school IAQ policy. The panel consists of the following members:

### ***State of New Mexico***

New Mexico has chosen to use carbon dioxide levels as an indicator of proper ventilation. New Mexico has set the bar at 1,200 parts per million of carbon dioxide. One should not confuse carbon dioxide with carbon monoxide, the deadly gas that kills people at a very low level of 50 parts per million. Carbon dioxide is created when air is exhaled from our lungs as part of the breathing process. We generate 40,000 to 45,000 parts per million of carbon dioxide in our exhaled breath. This law set a standard, but it left confusion as to how the level of 1,200 parts per million should be measured. New Mexico is also attempting to accomplish IAQ-specific policy and programming such as an IAQ in-school inspection and evaluation program. The language within this policy stipulates the use of independent testing, adjusting and balancing of HVAC systems for inspection and evaluation of the IAQ in every New Mexico school. Moreover, it provides that this be carried out at least once every three years (State of New Mexico Proposed Senate Bill 0849, 2003).

This legislation is too simple and states only that the schools' HVAC systems must be working properly to meet several organizations' standards. It sets no guidelines as to who should carry out the testing. While it does provide for the work to be done independently and outside of school staff, this legislation does not ensure that qualified and certified HVAC testing, adjusting and balancing technicians are required to take care of IAQ testing in New Mexico schools.

### ***State of West Virginia***

West Virginia has adopted similar legislation that addresses the need for HVAC testing, adjusting and balancing. Regarding the air quality in schools, West Virginia requires the school building authority to develop rules and design the process for independent testing, adjusting, balancing and maintenance of HVAC systems, and also requires that only trained and certified technicians be responsible for this work. The legislation includes the reporting of completed training by HVAC personnel as well as a plan for continued education. Also required within this law is the reporting of certain IAQ problems to the appropriate state offices as part of the process in early detection and/or prevention of poor classroom air (West Virginia House Bill 18-9E-3, 1995).

### ***Summary of Reviewed States' IAQ Legislation***

Overall, each state has made an effort to combat poor IAQ in schools. But because the regulations of each state have such differing language and points of focus, there is no way to ensure that children in the classrooms of Georgia are

receiving the same appropriate and well-maintained IAQ as children in the classrooms of Indiana. These states also protect HVAC jobs in largely varying degrees. In the case of Georgia, this protection is nonexistent.

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