

23 05 93 – Testing, Adjusting and Balancing for HVAC

1. Introduction

- A. This section contains the requirements for inspecting, testing, adjusting and balancing of HVAC systems.
- B. The Contractor shall be AABC or NEBB certified and shall furnish all labor, tools and equipment required to complete the work.

2. References

- A. ASHRAE
- B. AABC
- C. NEBB
- D. SMACNA

3. Design Standards

- A. For constant volume supply and exhaust systems, the entire system shall be rebalanced after every project. This includes lab fume hood exhaust systems.
- B. Requirements and recommendations for acoustical and indoor air quality (IAQ) testing shall be considered and discussed with FMD during design.
- C. Building pressurization verification shall be considered. To determine offset airflow and building pressurization, the overall building outside air supply and exhaust quantities for minimum and maximum airflow operating conditions shall be tabulated and documented by the Engineer of Record.

4. Documentation and Review Requirements

- A. TAB strategies, procedures and reporting format shall be submitted for review and approval by FMD and design engineer before TAB work begins. The submittal shall include, but is not limited to:
 - 1. Specific systems listed clearly identifying each piece of equipment to be included in TAB work with appropriate test procedures and measurements to be taken.
 - 2. Instrument calibration records shall be provided on forms shown in NEBB, AABC or SMACNA with manufacturer's specified accuracy listed.
 - 3. Schematic diagrams and/or floorplans for all airflow and hydronic systems.

4. Locations of all airflow and pressure readings on schematic diagram(s).
 5. Air Handling Unit data shall include a static pressure profile diagram.
 6. Equipment nameplate and motor data.
 7. VFD maximum and “as-left” speed frequency setting. Include a list of all “as-left” VFD configuration parameters for all VFD’s included in TAB report.
 8. Static pressure set points for all supply and exhaust fans.
 9. Supply and return air temperature and humidity.
 10. Provide brief summary of how each air/water system was balanced, measurement locations, and explanation of all calculated values.
 11. Provide test report summary in the beginning of the test report.
 12. Provide deficiency summary in the test report
 13. Verify building pressurizations and airflow offsets meet values defined in design documents.
- B. Additional requirements for renovations affecting existing systems:
1. Existing conditions TAB data for air and hydronic systems are required during design phase. Coordinate scope of TAB work with Duke FMD.
5. Installation and Performance Requirements
- A. Prior to TAB work, the Contractor must verify the following: systems have been installed and are operating as specified, all balancing devices have been installed, all duct leakage tests have been completed and clean filters have been installed.
- B. All equipment shall be vibration tested and documented after installation.
- C. All instrumentation used for testing shall be calibrated within 6 months of use. Accuracy of the instrumentation shall not be less than what is specified by the instrument manufacturer.
- D. Balancing devices shall be marked by the Contractor to indicate final settings.
- E. Airflow tolerances
1. Office areas: -5%, +10%
 2. Classrooms: -5%, +10%
 3. Laboratories

- a. Supply: -0%, -10%
 - b. Exhaust: -0%, +10%
 - 4. Residences: +/- 10%
 - 5. Kitchens: -5%, +10%
 - 6. Heat Removal Ventilation: -5%, +10%
 - 7. Heating Ventilation: -0%, +10%
- F. Engineer of Record shall review all balancing reports to verify performance compliance with system design and overall building pressurization. Engineer shall communicate results with FMD DUES and project commissioning agent to resolve non-compliant performance issues.
6. As-Built Requirements
- A. Final report shall include a summary describing test methods, test results and major corrective actions taken.
 - B. Any system changes and/or modifications implemented after project TAB work intended to achieve project design requirements shall be re-tested and re-documented to reflect the most current system performance.