
230593 TESTING, ADJUSTING AND BALANCING FOR HVAC

Part 1 – GENERAL

1.1 Description

A. This section details the guidelines and expectations for the required testing, adjusting and balancing (TAB) of a new or renovated HVAC system on Johns Hopkins University Homewood Campus. Project conditions and requirements vary, thus precluding the absolute adherence to the items identified herein in all cases. However, unless there is adequate written justification and approval from the JHFRE Engineering and Energy Department, it is expected that these guidelines will govern the design and specifications.

B. All projects that include the addition of or modification to any BAS controller shall be commissioned. The BAS vendor is to coordinate with the TAB contractor and Certified Commissioning Authority (CxA) regarding testing times and allocate labor hours for both activities.

1.2 Submittals

A. TAB reports shall include single line schematic diagrams showing locations of HVAC system components, balancing devices, and measurement locations.

B. The TAB report shall provide a single line system schematic with static pressure profiles.

C. Design assumptions, calculations, conditions (both environmental & systems' output), philosophies and assumptions about systems/equipment shall be shared with the Testing, Adjusting and Balancing (TAB) Contractor through development of the specifications to perform the TAB.

1.3 Quality Assurance

A. Balancing shall be performed by a company that is AABC or NEBB certified.

B. The TAB contractor shall be a separate entity hired under a separate contract from the general or mechanical contractor.

C. The TAB contractor shall test all mechanical systems and complete all load calculations in compliance with the NC column in the table from Section 230500. If a Noise Criteria (NC) level is not indicated, the NC shall comply with industry standards. The specifications shall require the Testing and Balancing (TAB) agent to perform sound tests, or acquire the services of a sound consultant, and administer testing in accordance with applicable American Society of Testing and Materials (ASTM) standards to verify the installation complies with the requirements of Table 2-1. There shall be no testing tolerance.

Part 2 – PRODUCTS

2.1 General Requirements

A. Balancing airflow and water flow within distribution systems, including sub-mains, branches and terminals, to indicated quantities according to specified tolerances listed below:

1. AHUs and Fans: 0 to +10%.
2. Air Terminal Devices: +/- 5%.
3. Pumps: 0 to +10%.
4. Water Terminal Devices: +/- 5%.

B. The TAB submittal processes shall follow this sequence:

1. Quality-Assurance Submittals: Require within 30 days from Contractor's Notice to Proceed, an electronic PDF submission of evidence that the Testing, Adjusting and Balancing (TAB) Contractor and the Project's TAB team members meet qualifications specified above.

2. Contract Documents Examination Report: Required within 45 days from Contractor's Notice to Proceed, a submission of 2 copies of Contract Documents review report.

3. Strategies and Procedures Plan: Required within 60 days from Contractor's Notice to Proceed, a submission of 2 copies of TAB strategies and step-by-step procedures as specified (including a complete set of report forms intended for use on the Project).

C. The TAB contractor shall notify the Project Manager during Testing and Balancing if systems are not within design parameters and are out of acceptable ranges as per TAB standards. Additionally, the Testing and Balancing contractor shall submit found deficiencies immediately (prior to completion of final report) to the A/E or the General Contractor for review and development of remedial action. The Contractor shall submit to the Project Manager the plan of remedial action and anticipated schedule of implementation within 3 working days after the initial notice of discovery.

1. Any deficiencies shall be clearly denoted in the report as requiring action.

D. Certified TAB Reports: Required submission of 2 copies of reports prepared, on approved forms certified by the TAB Contractor.

Part 3 – EXECUTION

3.1 Specifications shall indicate providing a minimum of a 1-day service from TAB contractor to demonstrate and reproduce measurements shown in TAB report. If the recheck proves to be different from the final report by more than the 10% tolerances allowed, the balancing report shall be rejected.

A. If the report is rejected, all systems shall be readjusted and tested, new data recorded, new certified reports submitted and new inspection tests made, all at no cost to the owner.

3.2 Balancing devices shall be marked by the balancer to indicate final setting.

3.3 For Hydronic Systems, the specifications of the TAB shall include the following fundamental balancing procedures:

A. If multiple chilled water sources are included within the design, specify that the Contractor shall verify that the required flow to the equipment can be achieved from either source. Coordinate with the Project Manager/JHFRE to define the operational scenarios for testing in the specifications.

B. Initial testing and balancing shall include all loads, current and future, both for performance capacity (i.e., as with adding load to fully test chillers) and for distribution performance (i.e., ensuring that adequate flow is available throughout the system). Specify to install any temporary bypasses and/or equipment required to enable testing and balancing at anticipated present and future maximum loading.

C. Test reports shall be prepared with pertinent design data and numbers in sequence starting at the pump to the end of the system, including checking the sum of branch-circuit flows against approved pump flow rate. Variations that exceed the specified tolerances shall be corrected.

D. Provide schematic diagrams of systems' as-built piping layouts.

E. Specify that all manual valves opened for maximum flow.

F. Verify differential-pressure control valves set at specified differential pressure.

G. Verify the pump-motor load is checked as the motor shall not be in an overloaded condition.

3.4 For air systems, the specifications of the TAB shall include the following fundamental balancing procedures:

A. Test reports shall be prepared for both fans and outlets, using the manufacturer's outlet factors and recommended testing procedures. The summation of required outlet volumes with required fan volumes shall be cross-checked. Variations that exceed the specified tolerances shall be corrected.

B. Provide schematic diagrams of systems' as-built duct layouts shall be prepared.

C. For variable-air-volume systems, provide a plan to simulate diversity.