

SECTION 230593 - TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

A. Shop Drawings

1. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below:
2. Final Report: Upon verification and approval prepare final reports, type written, and organized and formatted as specified below. Submit 2 complete sets of final reports. Divide the contents of the report into the below listed divisions: General Information and Summary, Air Systems.

B. Quality Control

1. Agency Data: Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below.

1.2 QUALITY ASSURANCE

A. Codes and Standards:

1. AABC: "National Standards for Total System Balance".
2. ASHRAE: ASHRAE Handbook, Systems Volume, Chapter 37, Testing, Adjusting, and Balancing.

B. Agency Qualifications

1. The HVAC Contractor shall procure the services of an independent Balance and Testing Agency, approved by the Engineer, and a member of Associated Air Balance Council (AABC) or NEBB, which specializes in the balancing and testing of heating, ventilating, and air conditioning systems, to balance, adjust and test all air and water systems and equipment as herein specified.

C. TAB Firm Qualifications: Engage a TAB firm certified by either AABC or NEBB.

D. TAB Conference: Meet with Owner's and Architect's representatives on approval of TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized

service representatives, HVAC controls installers, and other support personnel. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:
 - a. Submittal distribution requirements.
 - b. The Contract Documents examination report.
 - c. TAB plan.
 - d. Work schedule and Project-site access requirements.
 - e. Coordination and cooperation of trades and subcontractors.
 - f. Coordination of documentation and communication flow.
 2. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:
 - a. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 - b. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.
- E. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems." NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems." SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing."

1.3 PROJECT CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 GENERAL

- A. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Note the locations of devices that are not accessible for testing and balancing.
- B. Report deficiencies discovered before and during performance of the testing and balancing procedures. Observe and record system reactions to changes in conditions. Record default setpoints if different from indicated values.

3.2 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING

- A. Air balance and testing shall not begin until the system has been completed and is in full working order. The Contractor shall put all heating, ventilating and air conditioning systems and equipment into full operation and shall continue the operation of same during each working day of testing and balancing.

3.3 PERFORMING TESTING, ADJUSTING, AND BALANCING

- A. Cut insulation, ductwork and equipment casings for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.
 - 1. Patch insulation, ductwork, and housings, using materials identical to those removed.
 - 2. Seal ducts and piping after testing. Test for leaks and repair if found.
 - 3. Plug and seal equipment casings after testing. Test for leaks and repair if found.
 - 4. Seal insulation to re-establish integrity of the vapor barrier.
- B. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, potentiometers and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
- C. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.
- D. Record external static pressure on a profile schematic for each piece of HVAC equipment.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Fan(s) shall be balanced so that VFD speed at 55 hz shall be equal to design air flow to allow for an increase in flow using the VFD.
- B. Adjust fans to deliver total indicated airflows within the maximum allowable fan motor speed listed by fan manufacturer.

3.5 PROCEDURES FOR CONDENSING UNITS

- A. Measure entering- and leaving-air temperatures.
- B. Record fan and motor operating data.

3.6 PROCEDURES FOR AIR COILS

- A. Measure, adjust, and record the following data for each refrigerant coil:
 - 1. Dry-bulb temperature of entering and leaving air.
 - 2. Wet-bulb temperature of entering and leaving air.

3. Airflow.

3.7 FINAL TEST AND BALANCE REPORT

- A. The report shall be a complete record of the HVAC system performance, including conditions of operation, items outstanding, and any deviations found during the T&B process. The final report also provides a reference of actual operating conditions for the owner and/or operations personnel. All measurements and test results that appear in the reports must be made on site and dated by the AABC technicians or test and balance engineers.
- B. One copy of the final test and balance report shall be sent to the engineer of record. Provide five additional copies to the contractor.

3.8 REVERIFICATION

- A. T&B Agency shall recheck all measurements and make adjustments as required to complete the balancing. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second verification.

3.9 ADDITIONAL TESTS

- A. Seasonal Periods: If initial T&B procedures were not performed during near-peak conditions, the engineer of record may request a temperature recheck to further verify performance at near-peak conditions.
- B. Duct Leakage Testing:
 1. Witness the duct pressure testing performed by the mechanical/installing contractor.
 2. Verify that proper test methods are used and that leakage rates are within specified tolerances.
 3. Report any deficiencies observed.

END OF SECTION 230593