

SECTION 15270 B - HVAC TESTING, BALANCING, AND ADJUSTING

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. AIR BALANCE: A complete air balance of this project will be required as specified in sections herein.
- B. TEST ALL EQUIPMENT: Verify that the equipment is performing basically as specified.
- C. Prepare a TEST REPORT: Submit test results, deficiency report, and recommendations.
- D. RETEST (in the presence of the Design Engineer) selected items as required to verify the test report accuracy.

1.02 QUALIFICATIONS

- A. The testing, balancing, and adjusting subcontractor shall be independent of any Contractor performing work on this project since one of his primary functions will be to verify the Contractor's performance as a third party professional representative.
- B. The agency shall be active in the field of Testing and Balancing of Heating, Ventilating, and Air Conditioning Systems and shall have successfully completed at least five projects of similar size and scope in which they have performed both a Temperature and an Energy Balance. The agency shall be AABC or NEBB certified.
- C. All work shall be done under the supervision of a Registered Professional Engineer of the State in which the Work is to be performed and who is a full-time employee of the agency with at least five years' experience in HVAC system testing and balancing. All reports shall bear this engineer's professional seal and signature certifying accuracy and corrections.

1.03 OMISSIONS OF MATERIALS AND EQUIPMENT

- A. All abnormal conditions shall be corrected and/or explained in the report. The TBA Contractor shall not be required to correct Contractor errors and/or omissions. It shall be the responsibility of the Testing Engineer to notify the Architect-Engineer and Contractor of problems found and works with them toward finding a satisfactory solution.

1.04 SUBMITTALS

- A. The contractor shall submit, within 45 days after Notice to Proceed six copies of submittal data on the qualifications of the Testing Company to which he has awarded the subcontract.
- B. Submittal shall include Professional Engineer Registration Number, Contracting License Number, and name of the proposed resident engineer for the project.
- C. Mechanical Contractor shall furnish to the Testing Agency one copy of approved submittal on all HVAC equipment and one set of HVAC plans and specifications immediately upon the Mechanical Contractor's receipt of notice to proceed with the Mechanical work.

1.05 APPROVAL

- A. No work shall be performed until the Architect-Engineer has "APPROVED" the qualification submittal of the Testing Agency.

1.06 WARRANTY

- A. The Test and Balance Agency shall include an extended warranty of one year after submission of report during which time the Architect-Engineer may request a recheck or resetting of any item included in the report. Should the Engineer find that the system has not been properly and completely balanced, the warranty period will be extended until the Architect-Engineer is completely satisfied.

1.07 REPORT

- A. The certified report shall include the following information:
 - 1. Complete testing and balancing data.

1.09 ACCEPTANCE

- A. The Owner and Architect-Engineer will not accept the building until the system has been properly started up and balanced, and is operating as per the design.

PART 2 – EQUIPMENT

2.01 INSTRUMENTS

- A. The Testing Agent shall own all the instruments, gages, thermometers, etc. necessary to properly do the work. These instruments shall include the following:
 - 1. Tachometer, Stroboscope, Pyrometer, Ammeter, Manometer, Anemometer, Magnehelic gages, Psychrometer, Orsat, and Velometer.

2.02 CALIBRATION

- A. All instruments shall have been recalibrated within 180 days of the performance of work. Certificates verifying the performance of calibration work shall be submitted to this Architect-Engineer with the final report.

PART 3 – EXECUTION

3.01 COORDINATION

- A. The Mechanical Contractor shall coordinate with the Testing Agency giving advance notice before testing and balancing is required. Testing Agency shall provide the Mechanical Contractor with a prebalancing checklist, which shall be reviewed by the Contractor.

3.02 PREPARATION

- A. The Contractor shall review the plans with the Testing Agency prior to installing the piping and ductwork systems to ensure the proper placement of all balancing devices. The Contractor shall have completed all duct work and installed all grilles, registers, diffusers, dampers, access doors, turning vanes, air monitors, balancing devices, etc., before the Testing and Balancing Agent begins his work.
- B. The Contractor shall complete the installation of all piping, insulation, controls (pneumatic or electric) and devices and place the entire system into operation before the TBA begins his balancing work.

3.03 PREPARATION PHASE I - JOB VISITS

- A. The agent shall make at least two visits to the project site during construction. The purpose of these visits are to ensure that all required test points, balancing dampers, flow measuring devices, etc., are being properly installed. The Agent shall report to the Architect-Engineer and Contractor any and all discrepancies he may find during each visit. The Testing and Balancing Agent shall be given access to the project site at all times.

3.04 PROCEDURE PHASE II - TEST AND BALANCE SYSTEM

- A. The Air Balance Agency shall perform the following tests and balance system in accordance with the following requirements:
1. Test and adjust blower RPM to design requirements.
 2. Test and record motor full load amperes.
 3. Make pitot tube traverse of main supply ducts and at each ventilating air duct runout and obtain design cfm at fans and at ventilating air duct runouts to meet Indoor Air Quality standards.
 4. Make pitot tube traverse of ventilating air runout ducts and balance to scheduled CFM values.
 5. Test and record system static pressures, suction and discharge.
 6. Test and adjust system for design recirculated air, cfm.
 7. Test and adjust system for design cfm outside air.
 8. Test and record entering air temperatures. (DB heating and cooling.)
 9. Test and record entering air temperatures. (WB cooling.)
 10. Test and record leaving air temperatures. (DB heating and cooling.)
 11. Test and record leaving air temperatures. (WB cooling.)
 12. Adjust all main supply and return air ducts to proper design cfm.
 13. Adjust all zones to proper design cfm, supply and return.
 14. Test and adjust each diffuser, grille and register to within $\pm 5\%$ of design requirements).
 15. Each grille, diffuser, and register shall be identified as to location and area.
 16. Size, type and manufacturer of diffusers, grilles, registers and tested equipment shall be identified and listed. Manufacturer's ratings on all equipment shall be used to make required calculations.
 17. Readings and tests of diffusers, grilles, and registers shall include required fpm velocity and test resultant velocity, required cfm and test resultant cfm after adjustments. All diffusers, grilles, and registers shall be adjusted to minimize drafts.
 18. In cooperation with the Control Manufacturer's Representative, setting adjustments of automatically operated dampers to operate as specified, indicated, and/or noted. Testing Agency shall check all controls for proper calibrations and list all controls requiring adjustment by control installers.
 19. The Contractor shall make any replacements of the pulleys, belts, and dampers of the addition of dampers required for correct balance as recommended by Air Balance Agency, at no additional cost to the Owner.
 20. Test and adjust the kitchen range hood(s) and other hoods to verify that the specified air quantities are being provided.
- B. The final zone supply air balance shall be based on even room-to-room temperatures with adjustments in air quantities as needed to obtain these even temperatures.

3.05 PROCEDURE - PHASE III - CONCLUSIONS AND RECOMMENDATIONS

- A. After the above phases are completed, the Project Engineer supervising the Testing and Balancing shall analyze the data and forward to the Architect-Engineer and Contractor a report of all tests performed.

END OF SECTION 15270B