

SECTION 15990

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section describes minimum requirements for testing and balancing of the mechanical systems provided by Tenants.

1.2 REFERENCES

- A. American Air Balance Council (AABC) - National Standards for Total System Balance.
- B. ASHRAE Standard 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
- C. National Environmental Balancing Bureau (NEBB) - Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.
- D. National Environmental Balancing Bureau (NEBB) Testing, Adjusting, Balancing Manual for Technicians.
- E. SMACNA - HVAC SYSTEMS Testing, Adjusting, and Balancing.

1.3 DESCRIPTION

- A. Test, balance and adjust Heating, ventilation, and domestic hot water circulation systems installed by the Tenant.
- B. Testing and balancing shall include but is not necessarily limited to:
 - 1. Ventilation systems:
 - a. Set supply air outlet and duct branch flows.
 - b. Set exhaust air inlet flows.
 - c. Test and balance fans in fan coil units, unit heaters and cabinet unit heaters that are installed by Tenant, and adjust outlets to proper flow.
 - 2. Fluid systems:
 - a. Liquid heat transfer systems (heating and cooling), including pumps, flow control and balancing valves at each device installed by Tenant.
 - b. Domestic hot water circulation system, where flow control valves are installed by Tenant.
 - 3. Obtain the services of a qualified independent agent to review and approve the Testing and Balancing Report.
 - 4. Submit three copies of the final approved report to ANC for review and acceptance. Include the report in O&M Manuals.

1.4 SUBMITTALS

- A. Submit three copies of the Testing and Balancing Report described in TESTING AND BALANCING REPORT that has been approved by Tenant's Engineer for review and acceptance. Include copies of the Testing and Balancing Agency's NEBB or AABC certification.
- B. O&M Manual: Include copies of the approved Testing and Balancing Report in O&M Manuals.

1.5 QUALITY ASSURANCE

- A. Testing and Balancing shall be performed by an agency certified by the National Environmental Balancing Bureau (NEBB) or certified by the American Air Balance Council (AABC) for air and hydronic balancing. Attach a copy of the certification to the balancing report.
- B. Balancing Standards: balancing shall be performed in accordance with NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems, AABC National Standards for Total System Balance, ASHRAE Standard 111, or SMACNA HVAC SYSTEMS Testing, Adjusting, and Balancing.
- C. The balancing report shall be written in a format equivalent to that shown in the SMACNA HVAC Systems Testing, Adjusting and Balancing manual.

1.6 TESTING AND BALANCING REPORT

- A. The Testing and Balancing Report shall include the following as a minimum:
 - 1. Report Title Page. Include specific tenant project identification
 - 2. Summary Comments.
 - 3. Instrument Calibration Report:
 - a. Include a complete list of test equipment used. List the instruments used on the project during the balancing work, on an NEBB "Instrument Calibration Report" form, or equivalent form. This includes flow measuring hoods and other related devices.
- B. Air Systems Report. Prepare a report for each air system balanced. Tabulate data separately for each system. Describe balancing method used for each system. At minimum, include the following:
 - 1. System drawings/diagram: Include plans and diagrams showing locations of air terminal units and pitot tube traverses. Identifiers used for equipment on the diagram shall relate to the identifiers used in the report. Include set of reduced size drawings with air outlets and equipment identified to correspond with data sheets.
 - 2. Include appropriate notes, static pressure reading locations, etc., taken during testing and balancing.
 - 3. Air Apparatus or Fan Test Report: Include pertinent data on the test report forms. If test data could not be measured, or is not applicable, indicate such on report forms. List how each actual cfm measurement was obtained (duct traverse, total of outlet airflows, or a combination).
 - 4. Duct Pitot Tube Traverse Reports: Include actual temperature and pressure readings recorded at the time of testing and balancing. Include sketches of ducts showing dimensions and locations of readings so airflow calculations can be verified.

5. Air Outlet Test Reports: Include applicable A_k factors and terminal device sizes. Include all field velocity data necessary to determine airflow. If flow measuring hoods used, indicate their use in the remarks column.
 6. Include complete identification of elements. Identify by box number, room name and number, air outlet symbol, orientation in room, etc., as necessary to identify the location of each element clearly and positively.
- C. Hydronic Systems Report. Prepare a report including each hydronic device balanced.. Describe balancing method used for each system. At minimum, include the following:
1. Schematic drawings/diagrams: Include plans and diagrams showing locations of all equipment included in the report. Include heat exchange equipment and locations of flow measuring devices. . Identifiers used for equipment on the diagram shall relate to the identifiers used in the report. Record actual locations of thermostats, and balancing valves with settings.
 2. Terminal Heat Exchange Equipment: Confirm that heating coil and terminal unit temperatures and pressures were recorded and properly entered on form. List how each terminal unit flow rate was determined. Include listings of balancing manufacturer and model, balancing valve settings, and differential pressure readings across the balancing valve.
 3. Include complete identification of elements. Identify by equipment tag number, room name and number, baseboard symbol, orientation in room, etc., as necessary to clearly and positively identify the location of each element.
- D. Domestic Water System Report:
1. Schematic drawings/diagrams: Include plans and diagrams showing locations of all equipment included in the report.
 2. Include tests for all hot water circulation system branch flow control valves. Include listings of balancing manufacturer and model, balancing valve settings, and differential pressure readings across the balancing valve.
- E. Provide report in soft cover, letter size, comb bound manuals, complete with index page and indexing tabs, with cover identification at front and side. Include drawings within report.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 ADJUSTMENT

- A. Air Outlets and Inlets: Adjust total to within plus or minus 10 percent of design to space. Adjust individual outlets and inlets in space to within plus or minus 10 percent of design.
- B. Hydronic Systems: Adjust to within plus or minus 10 percent of design.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

END OF SECTION