## PART 1 GENERAL

### 1.1 DESCRIPTION

A. Work Included: After completion of the work of installation, owner is responsible for procuring an air balancing and testing agency to test and regulate all components of the new heating, air conditioning and ventilating systems to verify air volumes and heating-cooling flow rates indicated on the Drawings. Provide TAB report to T.I. mechanical engineer for review. This specification section is provided for reference only.

B. Related Work: The requirements of Section 23 0500, Common HVAC Materials and Methods, also apply to this section.

C. Balancing Organization:
   1. Balancing of the Heating and Air Conditioning Systems: Performed by a firm providing this service established in the State of Oregon.
   2. Provide all necessary personnel, equipment, and services.
   3. Balancing Organization: Subject to compliance with these specifications, the following organizations may submit qualifications for approval Precision Test & Balance, Inc., Northwest Engineering Services, Air Balancing Specialties, Neudorfer Engineers, or approved.

### 1.2 QUALITY ASSURANCE

A. Balancing of the Heating and Air Conditioning Systems: Agency shall be a current member of NEBB or AABC specializing in the adjusting and balancing of systems specified with a minimum of 10 years documented experience.

B. Testing, adjusting, and balancing shall be performed under direct field supervision of a Certified NEBB Supervisor or a Certified AABC Supervisor.

### 1.3 SUBMITTALS

A. Balancing Data: Include the following minimum information in the Operation and Maintenance Data, as specified in Section 23 0500.
   1. Names or initials of personnel performing the balancing.
   2. Dates balancing were performed.
   3. List of balancing instruments utilized.
   4. Weather conditions at the time of the test.
   5. Mechanical system descriptions.
   6. All motor rated voltages, amps, starter and overload protective device sizes.
   7. All motor operating data.
   8. Fan cfm, rpm, operating static pressures, driven and motor sheave data, and all drive changes necessitated to obtain design capacities. List actual minimum outside air volumes measured for each system.
   9. All supply, return and exhaust air outlet cfm readings.
   10. Pump gpm, rpm, pressure, horsepower and service.
   11. Power Exhaust fan settings – cfm or % of supply airflow and power exhaust fan start point (% of outside air damper position).
   12. CO2 controller set points – minimum CO2 setpoint (ppm), maximum CO2 setpoint (ppm)(setting for min OSA at full occupancy).
   13. OSA intake damper settings at min occupancy and max occupancy (cfm or damper %)

B. Special Requirements:

1. Contractor Qualifications: Submit documentation within 14 days of the Contract Date demonstrating that TAB Contractor and Project Supervisor are NEBB certified.
2. Prebalancing Submittal: Provide submittal 30 days after approval of contractor's qualifications including:
   a. Preliminary TAB report including report documentation form with design data and existing equipment data listed.
   b. Description of balancing tolerances which are in accordance with NEBB standards.
   c. Review Contract Documents and provide list of provisions that are not included but necessary to complete work such as balancing dampers, valves, flow measuring stations, test plugs, access doors, etc.
   d. Review Contract Documents and provide a description of any conditions that are unclear, contradictory, or otherwise may prevent specified systems from achieving design performance.
   e. Provide a written description of test procedures that are unique to this project and not specified by NEBB standards.
3. Weekly Reports: Provide weekly status reports after balancing has started. Reports shall include a summary of work completed, abnormal or deficient conditions encountered, and updated schedule of work.
4. Draft Balancing Report: When balancing is complete in whole or for any major phase of work, provide three copies of draft balancing report to Engineer and Commissioning Authority for review. Engineer and Commissioning Authority shall provide written review comments to Balancing Contractor. Balancing report shall include information and data providing an exact record of system performance, documenting compliance with specification requirements, and enabling independent verification of all measurements. Reports shall include notes and comments necessary to clearly communicate balancing results. Report contents shall include the following information:
   a. NEBB certification
   b. Identification of all test instruments used and the last calibration dates.
   c. Plans or schematic diagram showing the location of equipment, measurement locations, and terminal devices. Plans shall show equipment and terminal device designation corresponding to report forms.
   d. Testing and balancing documentation recorded on NEBB report forms. Each report form shall include the name of individual performing TAB work. Forms shall be fully completed with all relevant data entered.
   e. Summary of minimum outside air ventilation measurements and adjustments.
   f. Summary of all conditions which are not in conformance with Contract Documents.
   g. Copy of written directives from the Engineer and other relevant project correspondence.
5. Final Balancing Report: Provide electronic certified copies of final balancing report bearing seal of Project Supervisor. Update draft balancing report responding to draft report review comments.

## 1.4 SEQUENCING

A. Prebalancing meeting shall be conducted 30 days prior to start of balancing.

B. Begin testing, adjusting, and balancing of systems after Construction Check/Start-up Plans are certified by the Commissioning Authority.

## 1.5 DETAILED REQUIREMENTS

A. Adjusting and Balancing:
   1. Prior to beginning the balancing work, obtain from the Architect the latest version of the mechanical drawings including addenda, revisions, change orders, etc.
   2. Adjust and balance all portions of the mechanical systems to produce indicated results within limits of minus 5 or plus 10 percent or as subsequently directed by the Architect.

3. Balancing data may be spot checked with instruments similar to that used by the balancing firm.
4. If, in the judgment of the Architect, the discrepancies warrant additional adjustment, readjust and rebalance the systems at no additional project cost.
5. Set outside air intake dampers to modulate between min occupancy setting and max as specified on drawings.

## PART 2 PRODUCTS

### 2.1 MATERIALS

A. Test Instruments: Furnished by Contractor.

B. Plugs: Provide plastic plugs in test holes drilled in ductwork. Provide UV resistant plugs for equipment located outdoors.

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Review Contract Documents for testing and balancing devices that are not included but necessary to complete work such as balancing dampers, valves, flow measuring stations, test plugs, access doors, etc. Submit list of recommended additional devices needed to perform work.

B. Review Contract Documents for any conditions that are unclear, contradictory, or otherwise may prevent specified systems from achieving design performance. Submit list of conditions observed.

### 3.2 APPLICATION

A. Work shall be performed in accordance with the latest addition of the NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

B. Accuracy of measurements and balancing tolerances shall be in accordance with NEBB standards.

C. Special Balancing Procedures
1. Motors: Record starter overload settings. List overload part number and rating for bimetallic overloads or setpoint for adjustable overload devices.
2. Pumps: Perform dead head test for all pumps ½ hp and larger.
3. Mark final position of balancing devices after balancing is complete.
4. Adjust slot diffusers so air flow is directed away from light fixtures, space temperature/humidity transmitters, and toward floor.

D. Calibration and Testing
1. Perform tests as required to determine control setpoints and control parameters including but not limited to:
   a. Minimum outside air ventilation parameters to achieve minimum ventilation rates as specified and as shown on Drawings.
   b. Provide a summary report of final control setpoints and parameters in report.
2. Perform field verification and calibration airflow transmitters.
   a. Airflow verification shall be performed by duct traverse in straight section of ductwork to provide measurement accuracy of +/- 5% better.
   b. Provide a summary report of final parameters in report.

E. Balancing is complete when following conditions are achieved:
   1. Systems and components are tested and balanced within specified tolerances.
   2. All efforts within the extent of TAB have been exhausted, and systems or components are not operating within acceptable tolerances. Balancing is not complete until written notification of all abnormal or deficient conditions is provided to the Engineer, written direction is received, and all work required by Contract Documents is fully completed.

### 3.3 FIELD QUALITY CONTROL

A. Testing instruments shall be reliable, accurate, and in good working order. Calibration maintenance of all instruments shall be in accordance with NEBB requirements.

**END OF SECTION**