

## SECTION 23 05 93 - TESTING ADJUSTING AND BALANCING

### PART 1 - GENERAL

#### 1.1 SECTION INCLUDES

- A. Testing, adjusting, and balancing of air and water systems specified in Division 23.
- B. Work shall generally consist of volume adjustments, speed adjustments, performing tests, recording equipment data and measurements, and preparing reports to achieve system performance as required by Contract Documents.
- C. Where work involves modification of existing systems, the Contractor shall perform testing adjusting, and balancing of all related equipment and systems required to achieve system performance shown on Drawings and as specified. This includes interrelated equipment and systems which are not modified, but where testing, adjusting, and balancing is required to achieve overall system performance.

#### 1.2 DEFINITIONS

- A. TAB: Testing, adjusting, and balancing.
- B. NEBB: National Environmental Balancing Bureau.
- C. Project Supervisor: Individual employed by balancing contractor having administrative and technical responsibility for work performed under this Section.
- D. BAS: Building Automation System. Automatic control system consisting of standalone or integrated digital controllers used to control HVAC equipment.

#### 1.3 SUBMITTALS

- A. 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 BAS system calibration measurements and tests required to establish setpoint or control parameters.
  - f. Summary of minimum outside air ventilation measurements and adjustments.
  - g. Summary of all conditions which are not in conformance with Contract Documents.
  - h. 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 QUALITY ASSURANCE

- A. Balancing Contractor and Project Supervisor shall be certified by NEBB.
- B. Pre-approved contractors: Air Balancing Specialties; AIR, Inc.; Neudorfer Engineers.
- C. All work under this Section shall be performed under the direction of the Project Supervisor.
- D. Balancing Contractor shall attend a prebalancing coordination meeting with the Owner's Authorized Representative, Engineer, and Contractor. Meeting agenda shall include: coordination of work between Balancing Contractor and Control Contractor, balancing procedures, and schedule of work. Meeting shall be attended by Project Supervisor.

#### 1.5 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.

## 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.
  - 5. Coordinate with HVAC Contractor to conduct and/or at least witness duct pressure tests.
- D. BAS Calibration and Testing
  - 1. Perform tests as required to determine BAS 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. Minimum pressure setpoints for variable volume air or water system speed control required to meet peak load conditions.
    - c. Provide a summary report of final BAS control setpoints and parameters in report.
  - 2. Perform field verification and calibration of BAS airflow and water flow 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 BAS calibration parameters in report.
  - 3. Perform tests as required to determine calibration parameters for terminal unit flow measurement. Test at maximum, minimum, and zero flow. Provide a summary report of terminal unit calibration tests and BAS 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 23 05 93