

Seaside Rehabilitation Center
Portland, Maine
For Bid
July 18, 2014

SECTION 230593 - TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 - GENERAL

- 1.1 DESCRIPTION: The work covered by this section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required for testing and balancing the total supply, return, exhaust and outside airflows and waterflows as indicated.
- 1.2 GENERAL REQUIREMENTS: The provisions of Section 230500 "Common Work Results for HVAC", apply to this section.
- 1.3 DEFINITIONS
- A. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment, (e.g., reduce fan speed, throttling).
 - B. Balance: To proportion flows within the distribution system (submains, branches and terminals) in accordance with specified design quantities.
 - C. Procedure: Standardize approach and execution of sequence of work operations to yield reproducible results.
 - D. Report Forms: Test data sheets arranged for collection of test data in logical order to submission and review. This data should also form the permanent record which shall be used as the basis for any future testing, adjusting, and balancing required.
 - E. Test: To determine quantitative performance of equipment.
- 1.4 SUBMITTALS: Submit the following:
- A. Standards Compliance:

Testing Agency
Testing Agency Personnel
Professional Engineers
Instrument Calibration
- 1.5 TESTING AND BALANCING AGENCY
- A. Air Systems Testing and Balancing: Upon completion of the installation and field testing, performance test and adjust the supply, return, make-up and exhaust air systems, to provide the air volume and water flow quantities indicated. Accomplish work in accordance with the agenda and procedures specified and AABC 71679 and standards of the NEBB. Correct air and system performance deficiencies disclosed by the test before balancing the systems.
 - B. Agency Qualifications: Obtain the services of a qualified testing organization to perform the testing and balancing work as herein specified. Prior to commencing work under this section of the specifications, the testing organization shall have been reviewed by the Engineer. The criteria for determining qualifications shall be membership in the AABC, or certification by

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the NEBB, or the testing organization shall have submitted proof to satisfy the Engineer that the organization meets or exceeds the technical standards for membership of the AABC as published in the AABC 71679. The testing organization shall be independent of both the installing contractors and equipment suppliers for this project.

1.6 AGENDA

- A. Preliminary Report: Review drawings and specifications prior to installation of any of the affected system. Submit a written report to the Engineer indicating any deficiencies in the system that would preclude the proper adjusting, balancing, and testing of the systems.

1.7 PROCEDURES, GENERAL

- A. Requirements: Adjust systems and components thereof that perform as required by drawings and specifications.
- B. Test Duration: Operating tests of heating and cooling coils, fans and other equipment shall be of not less than 4 hours duration, after stabilized operating conditions have been established. Capacities shall be based on temperatures and air and water quantities measured during such tests.
- C. Instrumentation: Method of application of instrumentation shall be in accordance with the manufacturer's instructions. Furnish personnel, instruments, and equipment for tests specified herein.
- D. Accuracy of Instruments: Instruments used for measurements shall be accurate. Provide calibration histories for each instrument for examination. Calibrate each test instrument by an reviewed laboratory or by the manufacturer. The Engineer has the right to request instrument recalibration, or the use of other instruments and test methodology, where accuracy of readings is questionable.
- E. Accuracy of Thermometers: Plus or minus one graduation at the temperatures to be measured. Graduations shall conform with the following schedule:

Medium	Design Temperature Differential (°F)	Maximum Graduation (°F)
Air	10 or less	1/2
Air	over 10	1

- F. Flow Rate Tolerance: Values are based on discussion in ASHRAE "HVAC Applications", Chapter 34. Air filter resistance during tests, artificially imposed if necessary, shall be 80 percent of final values.
 - 1. Air Handling Unit CFM: Minus 0 percent to plus 10 percent.
 - 2. Other Fans: Minus 0 percent to plus 10 percent.
 - 3. Air Terminal Units (VAV Boxes): Minus 5 percent to plus 10 percent.

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4. Minimum Outside Air (for manually set dampers): Minus 0 percent to plus 10 percent.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 WATER SYSTEM PROCEDURES

- A. Adjustment: Adjust heating, water systems to provide required quantity to, or through each component.
- B. Metering: Measure water quantities and pressures with calibrated meters.
- C. Water Measurements and Balancing: Use venturi tubes, orifices, or other metering fittings and pressure gages. Adjust systems to provide the design flow rates through the heat transfer equipment prior to the capacity testing. Perform measurement of temperature differential with the air system, adjusted as described herein, in operation.
- D. Automatic Controls: Position automatic control valves for full flow through the heat transfer equipment of the system during tests.
- E. Flow: Flow through by-pass circuits at three-way valves shall be adjusted to balance that through the supply circuit.
- F. Distribution: Adjust distribution by means of balancing devices (cocks, valves, and fittings) and automatic flow control valves. Do not use service valves for adjustment. Where automatic flow control valves are utilized in lieu of venturi tubes, record only the pressure drop across the valve if within the pressure drop rating on the valve tag.
- G. Special Procedures: Where available, pump capacity (as designed) is less than total flow requirements of individual heat transfer units of system served, full flow may be simulated by the temporary restriction of flow to portions of the system.

3.2 CERTIFIED REPORTS

- A. Submittal: Submit three copies of the reports described herein, covering air system performance, air motion (fpm), to the Engineer prior to final tests and inspection.
- B. Instrument Records: Include types, serial numbers, and dates calibration of instruments.
- C. Reports: Reports shall identify conspicuously items not conforming to contract requirements, or obvious maloperation and deficiencies.
- D. Certification: The reports shall be certified by an independent Registered Professional Engineer who is versed in the field of air balancing and who is not affiliated with any firm involved in the design or construction phases of the project.

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3.3 WATER SYSTEM DATA

A. Report: Include data listed below:

1. Pumps:

a. Installation Data:

- 1) Manufacturer and Model
- 2) Size
- 3) Type Drive
- 4) Motor H.P., Voltage, Phase, and Full Load Amps.

b. Design Data:

- 1) G.P.M.
- 2) Head
- 3) R.P.M.
- 4) B.H.P. and Amps.

c. Recorded Data:

- 1) Discharge Pressures (Full-Flow and No-Flow)
- 2) Suction Pressures (Full-Flow and No-Flow)
- 3) Operating Head
- 4) Operating G.P.M. (from pump curves if metering is not provided)
- 5) No-Load Amps. (where possible)
- 6) Full-Flow Amps
- 7) No-Flow Amps

2. Air Heating and Cooling Equipment:

a. Design Data:

- 1) Load in Btu per hr
- 2) G.P.M.
- 3) Entering and Leaving Water Temperature
- 4) Entering and Leaving Air Conditions (D.B. and W.B.)
- 5) C.F.M.
- 6) Water Pressure Drop

b. Recorded Data:

- 1) Type of Equipment and Identification (location or number designation)
- 2) Entering and Leaving Air Conditions (D.B. and W.B.)
- 3) Entering and Leaving Water Temperatures
- 4) G.P.M. (if metered)
- 5) Temperature Rise or Drop

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3.4 FINAL TESTS, REVIEW, AND ACCEPTANCE

- A. Capacity and Performance Tests: Make tests to demonstrate that capacities and general performance of air and water systems comply with contract requirements.
- B. Final Inspection: At the time of final review, recheck, in the presence of the Engineer, random selections of data air quantities and air motion recorded in the certified report.
- C. Points and Areas for Recheck: As selected by the Engineer.
- D. Measurement and Test Procedures: As reviewed for work forming basis of certified report.
- E. Selections for Recheck (specific plus random): In general, selections for recheck will not exceed 25 percent of the total number tabulated in the report.
- F. Retests: If random tests elicit a measured flow deviation of ten percent or more from, or a sound level of 2 Db or more, greater than that recorded in the certified report listings, at ten percent or more of the rechecked selections, the report shall be automatically rejected. In the event the report is rejected, systems shall be readjusted and tested, new data recorded, new certified reports submitted, and new inspection tests made.
- G. Marking of Settings: Following final acceptance of certified reports by the Engineer, the settings of valves, dampers, and other adjustment devices shall be permanently marked, so that adjustment can be restored if disturbed at any time. Do not mark devices until after final review.

* END OF SECTION *