

MEA No.: 181001

SECTION 15600 - HVAC - COMPLETION, TESTING AND BALANCING

1.1 GENERAL

- A. All applicable requirements of Section 15000 - HEATING, VENTILATING AND AIR CONDITIONING, GENERAL shall apply to this entire Section and shall have the same force and effect as if fully included herein.

1.2 SCOPE

- A. This Section of the Specifications covers the furnishing of all labor, materials and accessories necessary for, but not limited to, the completion of the Contract, the required start up and field service requirements and the testing and balancing of all equipment specified in the Heating, Ventilating and Air Conditioning Sections of the Specification.

1.3 SERVICE

- A. The Contractor shall, after acceptance, provide any service incidental to the proper performance of the systems during the warranty period outlined in Section 15000.
- B. The Contractor shall, upon completion of the installation, during the warranty period, make available to the Owner an annual Service Agreement covering all labor and material required to efficiently maintain the control system.

1.4 FINAL CLEANING

- A. Remove soil, stain and adhered extraneous materials, caused by heating, ventilating and air conditioning work, from adjacent surfaces.
- B. Remove obstructions from ducts and piping. Remove, clean and replace strainers and filters that have been used during construction or testing period. Vacuum clean the inside of the ductwork where a significant amount of construction dust has accumulated.
- C. Clean exposed portions of heating, ventilating and air conditioning materials and equipment until it is free from soil, stain and extraneous materials.
- D. Remove and replace items or materials that cannot be satisfactorily cleaned.
- E. Flush all piping and clean strainers before operating the system.

1.5 BALANCING AND TESTING

- A. General
  - 1. The Contractor shall employ a balancing Contractor specializing in total system balancing, testing and commissioning. This balancing Contractor shall be certified by Associated Air Balance Council (AABC) or National Environment Balancing Bureau (NEBB) and shall provide all labor, engineering and test equipment required to adjust and balance all heating, ventilating and air conditioning and exhaust systems as hereinafter specified. All personnel involved in the execution of the work under the balancing contract shall be experienced and factory trained specifically in the total balancing of mechanical systems, as well as being regular employees of the balancing Contractor. Balancing contractor shall review the drawings during bid period.

- B. The balancing contract shall incorporate the following:
1. Adjust and balance the complete mechanical system as hereinafter specified.
  2. Record all test data and submit four copies upon completion of the balancing contract to the Owner's Representative.
  3. At the completion of the balancing contract instruct the Owner's personnel in the proper operation and maintenance of each piece of equipment.
- C. All test equipment will be furnished by the balancing Contractor and will remain his property. All instruments will have been calibrated recently and verification of calibration provided with submittal data.
- D. Testing and balancing shall not begin until the system has been completed and is in full working order with all filters installed. The Contractor shall put all heating, ventilating and air conditioning systems and equipment into full operation. Correct operation of equipment and system components and cleanliness of piping and ductwork shall be the responsibility of the Contractor.
- E. The Contractor shall make any changes required for correct balance, as recommended by the balancing Contractor, at no additional cost to the Owner. Such changes may encompass but are not necessarily restricted to pulleys, belts, ductwork, dampers or the addition of dampers and access doors.
- F. Testing Requirements
1. Air Systems
    - a. The testing and balancing shall include but is not necessarily limited to the following requirements:
      - 1) Test and adjust fan speeds to deliver the required CFM and record rpm and full load amperes.
      - 2) Make pitot tube traverse of main supply ducts to verify design CFM, where possible. Seal duct access holes with rubber or metal snap-in-plugs. The use of duct tape to seal access holes will not be permitted.
      - 3) Test and adjust system for design outside air.
      - 4) Test and adjust system for design recirculated air.
      - 5) Adjust all supply and return zones to design CFM.
      - 6) Test and adjust each diffuser, register and grille to within ten percent of design requirements and also adjust to minimize drafts in all areas.
      - 7) Balance the system to minimize noise. Add branch duct balancing dampers as required.
- G. Balancing Data:
1. The test report shall include the following information:
    - a. Motors:
      - 1) Manufacturer
      - 2) Model and Serial number
      - 3) Rated amperage and voltage
      - 4) Rated horsepower
      - 5) Rated RPM
      - 6) Corrected full load amperage

- 7) Measured amperage and voltage
- 8) Calculated BHP
- 9) Measured RPM
- 10) Sheave size, type and manufacturer

b. Fans:

- 1) Manufacturer
- 2) Model or Serial number
- 3) Rated CFM
- 4) Rated RPM
- 5) Rated pressures
- 6) Measured CFM
- 7) Measured RPM
- 8) Measured pressures
- 9) Pulley size, type and manufacturer
- 10) Belt size and quantity

c. Air Systems (including inlets and outlets):

- 1) Diffuser or register reference number and manufacturer
- 2) Diffuser or register location
- 3) Design velocity
- 4) Design CFM
- 5) Effective area factor and size
- 6) Measured velocity
- 7) Measured CFM

d. Instrument Calibration Report shall include the following information:

<u>Data Reported</u>	
Instrument/Make	Serial No.
Application	Dates of Use
Date(s) of Calibration	

e. Component Failure Report shall include the following information and shall be submitted as soon as a problem is encountered:

<u>Data Reported</u>	
Project	Contractor
Architect/Engineer	Submittal Data
System	Description and Problem
Component	Field Test Results
Manufacturer	Probable Cause
Serial No.	Recommendations
Model No.	Date

1.6 START-UP ASSISTANCE FOR AUTOMATIC TEMPERATURE CONTROLS

A. The Contractor shall include in his proposal an allowance for providing a factory trained field service technician at the job site during critical stages of installation and tests and at the time of start-up of the equipment, to perform the checkout, calibration and initial operation and to advise and instruct the Owner's personnel regarding operating techniques.

- 1. The Contractor shall allow eight hours of training for automatic temperature control system maintenance, trouble shooting and operation.

2. The Contractor shall cycle all equipment in the presence of the Owner or Owner's Representative.
  3. The field service technician shall submit a report to the Owner's Representative at each visit to the job site certifying that the equipment is being installed in accordance with the manufacturer's recommendations and shall report, immediately, any deviation from accepted installation procedures.
- B. At completion of the installation, the Contractor shall furnish to the Owner's Representative a certificate certifying that the equipment was installed in accordance with the manufacturer's recommendations.

1.7 EQUIPMENT START-UP

- A. Provide equipment start-up report, including checklist confirming manufacturer's start-up procedure has been followed in its entirety.

1.8 COMPLETION

- A. Upon completion of the work, the Contractor shall remove all his excess materials, machinery and equipment from the premises and replace all filters.

END OF SECTION 15600