1.0 GENERAL

.1 Summary

.1 Testing, adjustment, and balancing of air, water and hydronic heating and cooling systems.

.2 Measurement of final operating condition of HVAC systems.

.2 References

.1 AABC National Standards for Total System Balance.

.2 ASHRAE 111 Testing, Adjusting, and Balancing of Building HVAC Systems (ANSI Approved), Latest Edition.

.3 Quality Assurance

.1 Perform total system balance to AABC National Standards, ASHRAE ASHRAE 111-08 Testing, Adjusting, and Balancing of Building HVAC Systems and SMACNA Standards for air systems.

.2 Consultant to review and formally advise of acceptance and/or deficiency resolution based on Balancing Report (See part 3.0 Execution for details).

.4 Qualifications

.1 Balancing Agency: Company specializing in testing, adjusting, and balancing of systems with minimum five (5) years documented experience.

.5 Pre-Balancing Conference

.1 Pre-balancing site review and report shall be made by Balancing Agent to review general progress of work and note deficiencies that can affect Balancing of mechanical systems.

.6 Sequencing

.1 Sequence balancing work to commence as soon as systems are ready to be balanced. Balancing to be completed and report submitted prior to Substantial Completion of Project.

.7 Scheduling

.1 Contractor should schedule final test of life safety, smoke evacuation, and smoke control systems with the Consultants and the local Fire Authority. This test to be coordinated with balancing.

.2 Consultant to coordinate and schedule site reviews with Contractor, Commissioning Agent, and Controls Trade. Ensure balancing devices are being installed correctly and balancing occurs in sequence with Controls and Commissioning activities.

.3 Balancing Agent shall review on site to verify and ascertain correct devices being installed along with accessibility review and submit reports.

.4 Balancing Agent must allow for a minimum of 1 (one) post occupancy Balancing Trim during seasonal variations and occupancy variations. Balancing Trim to consist of review/re-verification of key balancing parameters, spot-check on all equipment, and review with facility staff. Balancing Agent to update report based on this post occupancy visit.

2.0 PRODUCTS

.1 Not Used

3.0 EXECUTION

.1 Examination

.1 Coordinate with Commissioning Agent: Contractors and Commissioning Agent to verify that systems are complete and operable before commencing commissioning work.

.2 Submit Field Reports: Report defects and deficiencies that prevent system balance during performance of services to Contractor and Consultant.

.2 Preparation

.1 Provide instruments required for testing, adjusting, and balancing operations. Ensure instruments are available to Consultant for spot checks during testing.

.3 Installation Tolerances

.1 Air Handling Systems: Adjust to within plus or minus 10% of design for supply systems and return and exhaust systems.

.2 Air Outlets and Inlets: Adjust outlets and inlets in space to within plus or minus 5% of design.

.3 Hydronic Systems: Adjust to within plus or minus 10% of design based on both flow and temperature difference at design points.

.4 Adjusting

.1 Permanently mark settings of valves, dampers, and other adjustment devices allowing settings with date of last adjustment.

.2 After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

.5 Air System Procedure

.1 Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

.2 Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 12.5 Pa (0.05 inches) positive static pressure near the building entries [in clean rooms].

.3 For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control. Coordinate and set up variable frequency drives for fans for airflow control.

.6 Water System Procedure

.1 Adjust water systems to provide required or design quantities.

.2 Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing**.**

.7 Submittals and Balancing Report Format

.1 Balancing Report Forms to include the following sections:

.1 Systems Summary.

.2 Deficiencies or Issues Noted.

.3 Balancing Methodology and Conditions of Balancing.

.4 Balancing Instrument List.

.5 Controls System Setpoints (eg. Differential Pressure settings, pump VFD speeds to achieve required flow, etc.).

.6 Controls confirmation protocol on how positive building air pressure is to be maintained.

.7 Equipment Data: Electric Motors, Pumps, etc. (All equipment).

.1 Rotation speed, HP, amperage, total head, and total static pressure, pulleys information where applicable.

.8 Ducting and Leak Test.

.9 Air Monitoring, Distribution, and Flow Measuring.

.10 Terminal Unit Data.

.11 Air, Water and Hydronic System Schematics:

.1 Indicating required and balanced air flows and fluid flows at all balanced/controlled points.

.2 Actual locations of flow measuring stations, balancing valves and flows, air valves and balancing dampers with final airflows.

.3 Complete summary of calibration settings used for devices and equipment.

.4 Include system schematic record drawings as part of drawing packages.

*** END OF **TESTING, ADJUSTING, AND BALANCING FOR HVAC** SECTION ***