NATIONAL BALANCING INSTITUTE CERTIFIED
AIR BALANCING SPECIFICATION

SECTION 15990
AIR TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 GENERAL CONDITIONS AND RELATED DOCUMENTS

A. The NBI Certified Testing and balancing contractor shall perform the work described in this specification under contract to the owner or the owners representative, but may be under contract with the General or Mechanical Contractor if approved by the owner.

B. It is acknowledged that the project drawings, plans and documents as well as General Conditions and the content of Section 15 of the project specifications are incorporated into the project requirements. Additions or changes to the project documents are to be delivered to the balancing contractor prior to the notice to proceed and the beginning of the air balancing work.

1.2 DESCRIPTION OF WORK TO BE PERFORMED

A. The testing and balancing contractor is to furnish all labor, testing materials and instruments, support equipment and tools, and report materials incidental to their scope of work.
B. The testing and balancing contractor prior to award of the contract, upon request, will provide evidence that this project is within the companies' expertise and experience for the size and scope of the project.
C. The National Balancing Institute Certification held by this contractor is to be current and be in good standing free from disciplinary action or restrictions.
D. Testing and balancing of the project may not begin until the mechanical systems are 100% complete. All ducting, fans, heating, cooling and ventilation equipment are to be operable and control systems are to be fully functioning.
E. Effective test and balancing work requires correlation between the mechanical trades to participate in the operation of the systems to produce effective results. Related contractors may be required to perform additional work to the systems to deliver the desired final result.

1.3 REFERENCES

A. ASHRAE Standard 111– Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air Conditioning and Refrigeration Systems.
B. NCI – Air Balance and HVAC System Diagnostics (NCI, National Comfort Institute, Inc. is the education, training and publications arm of the NBI Certification)
C. SMACNA – HVAC Systems Testing, Adjusting and Balancing
D. NCI – Practical Standards and Procedures for Air System Balancing.

1.4 SUBMITTALS

A. Provide to the awarding party a submittal package to be accepted for approval of air balancing contractor within 30 days, award of contract to follow within 30 days or prior to commencement of balancing work.

B. Submittal package to include a cover letter, biographies of balancing company staff, description of NBI certification requirements, a list of completed projects, test instrument documentation and calibration form, and samples of typical test report forms and procedures.

1.5 QUALITY ASSURANCE

A. Perform test and balance of mechanical systems according to plans and specifications in strict accordance with the National Comfort Institute Practical Standards, Forms and Procedures.

B. Invite owner or owner's representative to witness the balancing procedures or to participate in the testing of a system or zone within the project after submitting final report.

C. Should questions arise as to the credibility of the final test and balance report or accuracy of the test data. Test and balance contractor shall submit reports to the NBI technical committee for review.

1.6 QUALIFICATIONS

A. Test and balance contractor to hold a current NBI certification, and be in good standing with the National Comfort Institute. Possess accurate and calibrated test and balance instruments. Issue test and balance reports of data collected implementing NCI Practical Standards, Procedures and Forms.

1.7 STATE OF THE PROJECT AT COMMENCEMENT OF WORK

A. Prior to commencement of the test and balance work, the mechanical systems are to be started and fully functioning. A *Checklist Prior to Balancing* Report is to be sent to the installing contractor and returned attesting to the readiness of the systems for balancing.

PART 2 - PRODUCTS

2.1 INSTRUMENTS AND TOOLS

A. Test and balance contractor shall possess all the required tools and instruments necessary to achieve a full and effective balance of the mechanical systems according to the project specifications and are to be matched to the procedures and tasks required by the systems tested.

B. Other than adjustments to the systems, additional work required by other trades may be necessary in order to bring the systems into specified operating condition. Installation of balancing dampers, replacement of adjustable pulleys, belts, or other alterations required to achieve balance are to be performed by other subcontractors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The air conditioning, heating and ventilations systems including related electrical, plumbing, sheet metal, and controls systems are 100% complete and operable before the balancing is to begin.

1. Fans are to be powered and operating freely, rotating in the proper direction with adequate thermal overload protection per plans and specifications. All electrical, plumbing and other mechanical connections are made and tested for safe operation.

2. Controls are to be fully operable and controls contractor is to be available during the balancing process to interpret and manipulate system software and to provide connections or required hardware.

3. All manual and automatic volume dampers and valves, including smoke and fire dampers are in full open position, with mechanical handles, access doors and controls accessible.

4. Duct systems, filters, and coils are to be in new or refurbished condition and be free of construction debris or defects. Duct systems are to be completed including end caps and sealed joints, and access doors are to installed, tight and accessible.

5. All registers and grilles are to be operable and tightly installed.

B. The notice to proceed or contact requesting air balancing is accepted as evidence that the mechanical contractors have reviewed these requirements and acknowledges the systems are completed, in full and adequate operation and are functioning safely.

C. Included in the test and balance reports will be comments and test results relating to issues contained in the systems that may prevent the system form delivering optimum balance and performance.

3.2 ADJUSTMENT TOLERANCES

A. Airflow values including fans, registers and grilles, or air terminal boxes are to be adjusted to plus or minus 10% of design flow. If capacities are not obtainable, proportionally balance system and make repair or system modification recommendations.

C. Since temperature, pressure, fan speed, electrical values and some efficiencies are a result of flows set in the system, any variances of plus or minus 10% of design will be noted on the final reports.

D. If necessary modifications needed to achieve balance are minor and do not require a change order, recommendation may be made by the balancing contractor directly to related subcontractors and the work can proceed immediately. If modifications require a change order recommendations are to be made to the owner or owner's representative.

3.3 SYSTEM REPORTING AND PERMANENT MARKING

A. System tested or calculated values are to be entered with accuracy and integrity on the final balancing reports.

B. Permanently mark and record systems' mechanical and control settings once final or proportional balance has been achieved. Mark and fasten mechanical adjustments to assure fixed operation.

C. Upon completion, assure systems are in proper working order and that all controls have been returned to normal operating conditions or as instructed by owner or owner's representative. Leave systems tidy and ready for continuous operation.

3.4 AIR SYSTEMS BALANCING PROCEDURE

A. Follow NCI Air Test and Balance Procedures specific to the type and size of system being tested including all applicable NCI testing calculation and reporting procedures including:

1. Air Test and Balance Procedures

2. Airflow Traverse Procedure

3. Total Static Pressure and Pressure Drop Procedures

4. Temperature and BTU Measurement Procedures

5. Electrical and RPM Measurement Procedures

` 4. Proportional Balancing Procedure

5. Economizer Setup and Balancing Procedures

6. Exhaust System Balancing Procedure

7. Variable Air Volume Box Balancing Procedure

8. Kitchen Exhaust Balancing Procedures

9. Heat Recovery Ventilator Balancing Procedure

10. HSER™ or CSER™ Installed System Efficiency Rating

B. The work begins by gathering plans, specifications, mechanical submittals, related change orders and as built drawings, if possible.

C. Plans are to be marked, outlets and inlets numbered and design portion of reports prepared prior to arrival at job site.

D. Upon arrival at job site. Systems are to be walked and inspected and compared to plans and specifications, systems are to be complete and verified operable. Deficiencies are to be noted, if any, and responsible parties are to be notified.

E. Inspect systems for completion and compliance including air outlet and inlet locations, duct systems, equipment locations and accessibility, as well as damper positions, and cleanliness of coils and filters. Drill all required test holes in the system.

F. Start up equipment to call for full cooling operation, and check fan rotations and controls operations.

G. When system is in full operation and functions have stabilized, test airflow at appropriate locations and adjust fan speed to achieve required airflow plus 10%, if possible.

H. Test, adjust and verify return air, fresh air, exhaust air values ands record initial readings.

I. Follow the NCI Balancing Procedures and obtain a balance of plus or minus 10% of required airflow at each register. Retest and trim dampers to required airflow values. Adjust the system until required airflow is achieved. Avoid excessive noises and velocities.

J. If required airflow cannot be obtained, proportionally adjust the system, and record any system deficiencies and make system renovation recommendations.

K. Mark and record final damper, control and economizer settings and record any system deficiencies that exist.

L. Take and record final system air pressure readings including total external static pressure readings and pressure drops over required components.

M. Measure and record final temperature readings over heating exchangers and cooling coils as well as over the duct system including any fresh air or economizers and calculate system BTU delivery or removal.

N. Take and record electrical readings including Motor Amp draw and voltage readings.

O. Measure and record fan and motor speeds, as well as pulley and belt sizes, measure and record final dimensions and settings.

P. If system conditions and subject to constant change due to variable fans or terminal boxes, zoning systems or adjustable volumes of outside air, adjust system operation and measure key system values at minimum and maximum readings as well.

3.5 REPORT CONTENT REQUIREMENTS

A. Test and Balance Reports are to be on NCI forms and are to be an accurate record of the test data collected using corresponding test procedures.
B. Reports are to include the following minimum information. Additional comments will be required to portray the actual conditions found in the field and are to include a list of recommendations.
C. A typical air test and balance report is to include:

1. Title Page
    a. Balancing contractor name, address and contact information
    b. The date the report is issued
    c. Project name and location
    d. Project engineer and contact information
    e. Project Contractors

2. Project Certification
    a. Certifying Statement
    b. Name and contact information of balancing contractor
    c. Certification number
    d. Certification expiration date
    e. Certification stamp and authorized signature

3. HVAC System Air Balancing Reports (One for each system)
    a. System identification, location and area served
    b. Fan and motor data summary
    c. Equipment nameplate data
    d. Air outlet and inlet values – Design and actual
    e. System static pressure and component pressure drops
    f. Outside air CFM
    g. System temperatures
    h. Numbered outlets and inlets including location, codes and grille sizes
    i. Airflow reading percent of design
    j. Remarks and reference to field forms available

4. A Marked Corresponding Schematic of Each Zone
    a. Each grille and register marked to correlate with report
    b. Zone schematic to follow corresponding HVAC system air balance report
    c. Notes and comments may be made on schematic

5. Registers and Grilles Report
    a. A continuation of the HVAC System Balancing Report

6. Duct Traverse Forms
    a. Round or Rectangular Traverse form
    b. Completed according to corresponding test procedure
    c. Identification of system and traverse location
    d. Required and actual readings
    e. Traverse point location calculations
    f. Accurate record of velocity readings
    g. Airflow calculations
    h. Remarks and recommendations

7. Pulley Calculation Report
    a. Pertinent data extracted from previous reports
    b. Nameplate data
    c. Schematic of pulleys and belts
    d. Fan laws and calculations
    e. Comments and recommendations

8. HSER™ or CSER™ Reports
    a. An installed system efficiency rating method
    b. System identification
    c. Current weather conditions
    d. Rated equipment BTU capacity
    e. Airflow, wet and dry bulb readings
    f. Sensible or Total BTU calculations
    g. HSER™ or CSER™ efficiency calculations

9. Optional Test Reports Available
    a. These reports must be specified individually
    b. Each report is accompanies by written test procedures
    c. Kitchen Exhaust and Makeup air Reports
    d. Economizer Performance Report
    e. Heat Recovery Ventilator Report
    f. Combustion Efficiency Reports
    g. Total, Sensible and Latent BTU Delivery Reports
    h. Heating or Cooling System Performance Reports
    i. VAV / Terminal Box Report
    j. SDHV (Small Duct High Velocity) System Report
    k. Duct Leakage Test Report
    l. Building Pressure Test Report
    m. Carbon Monoxide Test Reports
    n. Combustion Efficiency Test Reports
    o. Various Performance Diagnostic Reports
    p. Hydronic Balancing Reports are also available

10. Test Instrument Report
    a. Test instrument listed by name
    b. Manufacturers and model number
    c. Calibration Dates
    d. Description

11. NBI Certification Certificate
    a. Copy of current NBI Certification Certificate
    b. Certification number
    c. Expiration date