

SECTION 23 05 93

TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.01 SUMMARY:

- A. This section provides the general requirements for testing, adjusting and balancing works of HVAC units

1.02 SCOPE OF WORKS:

- A. Adjustment of water flow and/or air flow to required condition indicated in specification, drawing and plans.
- B. Submit any required reports to show that equipment are in accordance of specification, drawings and plans.

1.03 RELATED WORKS:

- A. Section 23 21 23 - Pumps
- B. Section 23 64 26 - Package Screw Water Chillers
- C. Section 23 20 00 - HVAC Piping System
- D. Section 23 07 19 - Piping Insulation
- E. Section 23 05 23 - Valves

1.04 RELATED STANDARDS:

- A. National Standard for Total System Balance 2002 Associated Air Balance Council.

1.05 SUBMITTALS:

- A. General contractor shall to submit (3) three copies of qualification of TAB contractor.
- B. Submittal shall include:
 - 1. Copy of technician(s) certification.
 - 2. List of previous TAB works
 - 3. Copy of instrument calibrations.
 - 4. Others as required by Engineer.

1.06 QUALITY ASSURANCE:

- A. Before to proceed with TAB works all submittal have to be approved.
- B. TAB field work shall be performed under the direct supervision of an AABC or NEBB certified TAB supervisor or a Professional Engineer. This individual shall

perform the work or be on-site at least 33% of the total time TAB work is in progress.

- C. Any report shall be certificated by **Puerto Rico Professional Engineer**.
- D. The Professional Engineer shall include in his certification comments on the balance report an identification of any values that deviate from the allowed tolerances and an explanation of why the values cannot be met.
 - 1. The professional engineer shall indicated the corresponding recommendations to meet the design values of HVAC system. The TAB report shall not be accepted without this recommendations.

1.07 **RETAINAGE:**

Contract payment retainage may be withheld against the General Contractor until the final completion of this section of work has been demonstrated by the submission of the TAB report and an evaluation of its contents has been made by the coordinating Engineer, Commissioning Authority or his representative.

PART 2 - PRODUCTS

- 2.01 This section is not used.
- 2.02 If any product have to be used in TAB works, refers to corresponding specifications section or consult with Engineer.

PART 3 - EXECUTION

- 3.01 Duct systems designed for 3" or greater static pressure shall be pressure tested per SMACNA standards.
- 3.02 Use procedural standards for TAB of environmental systems as outlined in the latest versions of AABC, NEBB, and/or SMACNA procedural manuals. Once a procedural standard is selected, that same standard shall be applied to all equipment of that class for TAB work on this project.
- 3.03 TAB field work shall be performed under the direct supervision of an AABC or NEBB certified TAB supervisor or a Professional Engineer. This individual shall perform the work or be on-site at least 33% of the total time TAB work is in progress.
- 3.04 **SCHEDULING OF WORK:**
 - A. Coordinate scheduling of work with the General Contractor, appropriate subcontractors and the Engineer.
 - 1. Schedule TAB work to coincide with testing and verification of the temperature control systems where practical.
 - 2. Coordinate system startup and performance verification with the Engineer as TAB work is in progress.
 - B. Provide written notification to the Project Manager five (5) working days prior to commencing TAB and a schedule for completing the work.

- C. Provide written notification to the General Contractor Mechanical Contractor and Engineer, within 24 hours, of an equipment failure preventing TAB work from proceeding.
- 3.05 STATUS OF SYSTEMS:
- A. Air and hydronic TAB work shall not begin until the applicable system is cleaned, flushed, is in full working order and has been accepted by the Engineer.
 - B. Hydronic systems requiring glycol shall have the designated percentage installed prior to balancing.
- 3.06 REQUIREMENTS OF WORK:
- A. Adjust air handling systems to the following tolerances:
 - 1. Supply systems within +/- 10% of design value.
 - 2. Economizer damper systems shall be verified in the minimum and maximum positions.
 - B. Adjust hydronic systems to the following tolerances:
 - 1. Heating water systems within +/-10% of design value.
 - 2. Chilled water systems within +/- 5% of design value.
 - C. Permanently mark the final balance position of all balancing valves and dampers.
 - D. Report shall include an explanation of cause for any values, which cannot be brought within the tolerances shown above.
 - E. Unit ventilators shall be tested for supply air and outside air quantities at maximum and minimum outside air damper positions. Adjust dampers to meet scheduled values.
- 3.07 TAB REPORT:
- A. Provide a preliminary report to the Engineer within 5 days of finishing preliminary balancing.
 - B. Provide a draft TAB report to the Engineer. This shall be reviewed within 5 days and approved for use by the Professional. The Professional Engineer shall use the draft report for the purpose of verifying data within the draft TAB report. Upon completion, the draft TAB report and notes will be returned to the Engineer.
 - 1. The draft TAB report shall be in the same format and contain information as will be included in the final TAB report.
- 3.08 VERIFICATION:
- A. Upon completion of the TAB work the balancing firm shall demonstrate fluid flow quantities indicated in a preliminary TAB report.
 - 1. The TAB representative shall be a member of the same team used during the original testing.

2. Equipment used during the random testing shall be the same equipment used during the original testing.
3. The system or equipment being verified shall be in the same operating mode as during the original TAB test.
4. Up to 10% of the air readings shall be re-tested. Ninety percent (90%) of the re-tested readings must be within tolerances of the specifications.
5. Up to 10% of the balanced heating hydronic component readings shall be re-tested. Ninety percent (90%) of the re-tested readings must be within tolerances of the specifications.
6. Up to 20% of the balanced chilled water component readings shall be re-tested. Ninety percent (90%) of the re-tested readings must be within tolerances of the specifications.
7. Whenever system verifications do not meet specifications the entire system shall be re-balanced and rechecked.
8. When required by the Engineer, the TAB contractor shall perform unique tests to verify proper operation of special systems? An example of this would be testing of an ice bank thermal storage system.

END OF SECTION 15950