

**PART 1      General**

**1.1          GENERAL**

- .1      TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

**1.2          QUALIFICATIONS OF TAB PERSONNEL**

- .1      Names of personnel it is proposed to perform TAB to be submitted to and approved by Departmental Representative within 30 days of award of contract.
- .2      Provide documentation confirming qualifications, successful experience.

**1.3          PURPOSE OF TAB**

- .1      Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads
- .2      Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.
- .3      Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

**1.4          EXCEPTIONS**

- .1      TAB of systems and equipment regulated by codes, standards to be to satisfaction of authority having jurisdiction.

**1.5          CO-ORDINATION**

- .1      Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.
- .2      Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

**1.6          PRE-TAB REVIEW**

- .1      Review contract documents before project construction is started and confirm in writing to Departmental Representative adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

- .2 Review specified standards and report to Departmental Representative in writing all proposed procedures which vary from standard.
- .3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

**1.7 START-UP**

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- .2 Follow special start-up procedures specified elsewhere in Division 23.

**1.8 OPERATION OF SYSTEMS DURING TAB**

- .1 Operate systems for length of time required for TAB and as required by Departmental Representative for verification of TAB reports.

**1.9 START OF TAB**

- .1 Notify Departmental Representative 7 days prior to start of TAB.
- .2 Start TAB when work is essentially completed, including:
  - .1 Installation of ceilings, raised floors, doors, windows, other construction affecting TAB.
  - .2 Application of weather stripping, sealing, caulking.
  - .3 All pressure, leakage, other tests specified elsewhere in Division 23.
  - .4 All provisions for TAB installed and operational.
- .3 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
  - .1 Proper thermal overload protection in place for electrical equipment.
  - .2 Air systems:
    - .1 Filters in place, clean.
    - .2 Duct systems clean.
    - .3 Ducts, air shafts, ceiling plenums, and floor plenums are airtight to within specified tolerances.
    - .4 Correct fan rotation.
    - .5 Fire, smoke, volume control dampers installed and open.
    - .6 Coil fins combed, clean.
    - .7 Access doors, installed, closed.
    - .8 Outlets installed, volume control dampers open.
  - .3 Liquid systems:
    - .1 Flushed, filled, vented.
    - .2 Correct pump rotation.

- .3 Strainers in place, baskets clean.
- .4 Isolating and balancing valves installed, open.
- .5 Calibrated balancing valves installed, at factory settings.
- .6 Chemical treatment systems complete, operational.

**1.10 APPLICATION TOLERANCES**

- .1 Do TAB to following tolerances of design values:
  - .1 HVAC systems: plus 5 %, minus 5 %.
  - .2 Hydronic systems: plus or minus 10 %.

**1.11 ACCURACY TOLERANCES**

- .1 Measured values to be accurate to within plus or minus 2 % of actual values.

**1.12 INSTRUMENTS**

- .1 Prior to TAB, submit to Departmental Representative list of instruments to be used together with serial numbers.
- .2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .3 Calibrate within 3 months of TAB. Provide certificate of calibration to Departmental Representative.

**1.13 SUBMITTALS**

- .1 Submit, prior to commencement of TAB:
  - .1 Proposed methodology and procedures for performing TAB if different from referenced standard.

**1.14 PRELIMINARY TAB REPORT**

- .1 Submit for checking and approval of Departmental Representative, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
  - .1 Details of instruments used.
  - .2 Details of TAB procedures employed.
  - .3 Calculations procedures.
  - .4 Summaries.

**1.15 TAB REPORT**

- .1 Format to be in accordance with referenced standard.
- .2 TAB report to show results in SI units and to include:

- .1 Project record drawings.
- .2 System schematics.
- .3 Submit 6 copies of TAB Report to Departmental Representative for verification and approval, in English in D-ring binders, complete with index tabs.

**1.16 VERIFICATION**

- .1 Reported results subject to verification by Departmental Representative.
- .2 Provide manpower and instrumentation to verify up to 30 % of reported results.
- .3 Number and location of verified results to be at discretion of Departmental Representative.
- .4 Bear costs to repeat TAB as required to satisfaction of Departmental Representative.

**1.17 SETTINGS**

- .1 After TAB is completed to satisfaction of Departmental Representative, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.
- .2 Permanently mark settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

**1.18 COMPLETION OF TAB**

- .1 TAB to be considered complete when final TAB Report received and approved by Departmental Representative.

**1.19 AIR SYSTEMS**

- .1 Standard: TAB to be to most stringent of this section or TAB standards of AABC.
- .2 Do TAB of following systems, equipment, components, controls:
  - .1 Ventilation supplies to each fan coil from VAV terminals where VAV values are to be modified.
  - .2 Fan Coils supply to each zone where Fan Coil airflow volumes have been modified.
- .3 Qualifications: personnel performing TAB to be qualified to standards of AABC or NEBB.
- .4 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dew point), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

- .5 Locations of systems measurements to include, but not be limited to, following as appropriate: Main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

#### 1.20 HYDRONIC SYSTEMS

- .1 Definitions: for purposes of this section, to include low pressure chilled water, glycol heating systems.
- .2 Standard: TAB to be to most stringent of this section or TAB standards of AABC.
- .3 Do TAB of the following systems, equipment, components, controls:
  - .1 Balance heating flow to heating component including fan coils where fan coil requirements have been modified. Measure all flows using installed circuit balancing valves.
  - .2 Balance chilled water flow to all cooling component including fan coils where fan coils requirements have been modified. Measure all flows using installed circuit balancing valves.
- .4 Qualifications: personnel performing TAB to be qualified to standards of AABC or NEBB.
- .5 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: Flow rate, static pressure, pressure drop (or loss), temperature, specific gravity, density, RPM, electrical power, voltage, noise, vibration.
- .6 Locations of equipment measurement: To include, but not be limited to, following as appropriate:
  - .1 Inlet and outlet of control valve, other equipment causing changes in conditions.
  - .2 At controllers, controlled device.
- .7 Locations of systems measurements to include, but not be limited to, following as appropriate: Supply and return of primary and secondary loops (main, main branch, branch, sub-branch of all hydronic systems, inlet connection of make-up water.

#### 1.21 DOMESTIC SYSTEMS

- .1 Meet requirements as specified for hydronic systems.
- .2 Locations of equipment measurements: To include, but not be limited to, following as appropriate: Inlet and outlet of heaters, tank, pump, circulator, at controllers, controlled device.
- .3 Plumbing systems:
  - .1 TAB procedures:
    - .1 Pumped sanitary systems: test for proper operation at all possible flow rates.

**1.22 OTHER TAB REQUIREMENTS**

- .1 General requirements applicable to work specified this paragraph:
  - .1 Qualifications of TAB personnel: as for air systems specified this section.
  - .2 Quality assurance: as for air systems specified this section.

**1.23 POST- OCCUPANCY TAB**

- .1 Participate in systems checks twice during Warranty Period - #1 approximately 3 months after acceptance and #2 within 1 month of termination of Warranty Period.

**PART 2 Products**

**2.1 NOT USED**

**PART 3 Execution**

**3.1 NOT USED**

**END OF SECTION**