

Part 1 General

1.1 GENERAL REQUIREMENTS

- .1 The Contractor shall be responsible to carry out all the Work set out or referred to in this Section 23 05 93.

1.2 SUMMARY

- .1 "TAB" is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.
- .2 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.

1.3 QUALIFICATIONS OF TAB PERSONNEL

- .1 Submit names of personnel to perform TAB to Engineer within 90 days of Execution Date.
- .2 Provide documentation confirming qualifications, successful experience.
- .3 TAB: performed in accordance with the requirements of standard under which TAB firm's qualifications are approved:
 - .1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.
 - .2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing - 2002.
- .4 Recommendations and suggested practices contained in the TAB Standard: mandatory.
- .5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.
- .6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.
- .7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.
- .8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract:
 - .1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.
 - .2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.4 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 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.
- .4 Advise Engineer and if additional sheaves required to meet balance point.

1.5 EXCEPTIONS

- .1 TAB of systems and equipment regulated by Governmental Authorities shall be to satisfaction of such Governmental Authorities.

1.6 CO-ORDINATION

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

1.7 PRE-TAB REVIEW

- .1 Review Contract Documents before Construction Work is started and confirm in writing to Architect of Record 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 and Engineer in writing proposed procedures which vary from this Section.
- .3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.8 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.

1.9 OPERATION OF SYSTEMS DURING TAB

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

1.10 START OF TAB

- .1 Notify Engineer 14 days prior to start of TAB.
- .2 Start TAB when project is Substantially Complete. TAB shall include, without limitation:
 - .1 Installation of ceilings, doors, windows, other construction affecting TAB.
 - .2 Application of weather stripping, sealing, and caulking.
 - .3 Pressure, leakage, other tests specified elsewhere Division 23.
 - .4 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 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.
 - .9 Duct system leakage test is complete.
 - .10 HVAC controls system complete, operational.
 - .3 Water 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.
 - .7 HVAC controls system complete, operational.

1.11 APPLICATION TOLERANCES

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

1.12 ACCURACY TOLERANCES

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

1.13 INSTRUMENTS

- .1 Prior to TAB, submit to Engineer list of instruments 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 28 days of TAB. Provide certificate of calibration to Engineer.

1.14 SUBMITTALS

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

1.15 PRELIMINARY TAB REPORT

- .1 Submit for checking and approval of Departmental Representative and Engineer 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.

1.16 TAB REPORT

- .1 Submit format for approval with referenced standard.
- .2 TAB report to show results in English units and to include:
 - .1 Project record drawings.
 - .2 System schematics.
- .3 Submit 4 bound copies of TAB Report in English to Departmental Representative and Engineer for verification and approval.

1.17 VERIFICATION

- .1 Reported results subject to verification by Engineer.
- .2 Provide personnel and instrumentation to verify up to 30% of reported results.
- .3 Number and location of verified results as directed by Engineer.
- .4 Repeat TAB as required to satisfaction of Departmental Representative and Engineer.

1.18 SETTINGS

- .1 After TAB is completed to satisfaction of Departmental Representative and Engineer, replace drive guards, close access doors, lock devices in set positions and ensure sensors are at required settings.

- .2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.19 COMPLETION OF TAB

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

1.20 AIR SYSTEMS

- .1 Standard: TAB to AABC, SMACNA and ASHRAE.
- .2 Do TAB of systems, equipment, components, controls specified Division 23 following systems, equipment, components, controls:
 - .1 Terminal Units.
 - .2 All grilles and diffusers as indicated.
 - .3 Fans.
- .3 Qualifications: personnel performing TAB/current member in good standing of AABC qualified to standards of AABC.
- .4 Quality assurance: perform TAB under direction of supervisor qualified to standards of AABC.
- .5 Measurements: to include 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.
- .6 Locations of equipment measurements: to include as appropriate:
 - .1 Inlet and outlet of dampers, filter, coil, fan, other equipment causing changes in conditions.
 - .2 At controllers, controlled device.
- .7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.21 HYDRONIC SYSTEMS

- .1 Standard: TAB to most stringent of this section of TAB standards of AABC, NEBB, SMACNA and ASHRAE.
- .2 Qualifications: personnel performing TAB current member in good standing of AABC.
- .3 Quality assurance: perform TAB under direction of supervisor qualified to standards of AABC.
- .4 Measurements: to include as appropriate for systems, equipment, components, controls: flow, pressure, temperature, specific gravity, RPM, electrical power (voltage current draw).

- .5 Locations of equipment measurements: to include as appropriate:
 - .1 Pumps, Control valves and other auxiliary equipment.
 - .2 At controllers, controlled device.
- .6 Locations of system measurements to include as appropriate.

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.
- .2 Building pressure conditions:
 - .1 Adjust HVAC systems, equipment, controls to ensure specified pressure conditions at all times.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION