

1 General

1.1 QUALIFICATIONS OF TAB PERSONNEL

- .1 Submit names of personnel to perform TAB to Departmental Representative within 90 days of award of contract.
- .2 Provide documentation confirming qualifications, successful experience. TAB Contractor shall have a minimum of five (5) years experience to AABC, NBC, NEBB or SMACNA
- .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.
 - .2 National Balancing Council (NBC) Certified Air Balancing Specifications and Certified Hydronic Balancing Specifications.
 - .3 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.
 - .4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing.
- .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.

1.2 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.

1.3 EXCEPTIONS

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

1.4 CO-ORDINATION

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule 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.
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1.5 PRE-TAB REVIEW

- .1 Review contract documents before project construction is started 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 proposed procedures which vary from standard.
- .3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.6 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.

1.7 OPERATION OF SYSTEMS DURING TAB

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

1.8 START OF TAB

- .1 Notify Departmental Representative seven (7) days prior to start of TAB.
- .2 Start TAB when building is essentially completed, including:
 - .1 Installation of ceilings, doors, windows, other construction affecting TAB.
 - .2 Application of weatherstripping, 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.
 - .3 Liquid Systems:
 - .1 Flushed, filled, vented.
 - .2 Correct pump rotation.
 - .3 Strainers in place, baskets clean.
 - .4 Isolation and balancing valves installed and open.
 - .5 Calibrated balancing valve installed at factory settings.

1.9 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%.

1.10 ACCURACY TOLERANCES

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

1.11 INSTRUMENTS

- .1 Prior to TAB, submit to Departmental Representative 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 3 months of TAB. Provide certificate of calibration to Departmental Representative.

1.12 SUBMITTALS

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

1.13 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.
- .2 Format in accordance with referenced standard.
- .3 TAB report to show results in SI units and to include:
 - .1 Project record drawings.
 - .2 System schematics.
- .4 Submit three (3) copies of TAB Report to Departmental Representative for verification and approval, in English in D-ring binders, complete with index tabs.

1.14 VERIFICATION

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

1.15 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. Do not eradicate or cover markings.

1.16 COMPLETION OF TAB

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

1.17 AIR SYSTEMS

- .1 Standard: TAB to most stringent of this section.
 - .2 Do TAB of systems, equipment, components, controls specified in other Divisions.
 - .3 Qualifications: personnel performing to be qualified to Standards of AABC, NBC or NEBB.
 - .4 Quality assurance: perform TAB under direction of supervisor qualified to Standards of
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- AABC, NBC, or NEBB.
- .5 Measurements: to include as appropriate for systems, equipment, components, controls:
 - .1 Flow rate
 - .2 Pressure drop (or loss)
 - .3 Temperatures (dry bulb, wet bulb, dewpoint)
 - .4 RPM
 - .5 Electrical power
 - .6 Voltage
 - .7 Noise
 - .8 Vibration
 - .9 Amperage and volts for each stage of electric heating coils.
- .6 Locations of equipment measurements: to include but not be limited to, following as appropriate:
 - .1 Inlet and outlet of dampers
 - .2 Filter
 - .3 Coil
 - .4 Fan
 - .5 Other equipment causing changes in conditions.
 - .6 Controllers.
 - .7 Controlled device.
- .7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.18 HYDRONIC SYSTEMS

- .1 Definitions: for purposes of this section, to include low pressure hot water heating, glycol systems.
- .2 Standard: TAB to be to most stringent of TAB standards of AABC, NBC or NEBB.
- .3 Do TAB of systems, equipment, components, controls specified in other Divisions.
- .4 Qualifications: personnel performing TAB to be qualified to standards of AABC, NBC or NEBB.
- .5 Quality assurance: perform TAB under direction of supervisor qualified to standards of AABC, NBC or NEBB.
- .6 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls:
 - .1 Flow rate
 - .2 Static pressure
 - .3 Pressure drop (or loss)
 - .4 Temperature
 - .5 Specific gravity
 - .6 Density
 - .7 RPM
 - .8 Electrical power
 - .9 Voltage
 - .10 Noise
 - .11 Vibration
- .7 Locations of equipment measurement: to include, but not limited to, following as appropriate:
 - .1 Boiler
 - .2 Coil
 - .3 Pump

- .4 PRV
- .5 Control valve
- .6 Other equipment causing changes in conditions
- .7 At controllers
- .8 Controlled device
- .8 Locations of systems measurements to include, but not 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.

1.19 DOMESTIC WATER SYSTEMS

- .1 Meet requirements as specified for hydronic systems.
- .2 Locations of equipment measurements: to include, but not limited to, following as appropriate: inlet and outlet heaters, tank, pump, circulator, at controllers, controlled device.
- .3 Locations of systems measurements to include, but not limited to, following as appropriate: main, main branch, branch, sub-branch.

1.20 OTHER SYSTEMS

- .1 Plumbing systems:
 - .1 Standard: National Plumbing Code.

1.21 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 during winter and summer design conditions.
- .3 Smoke management systems:
 - .1 Test for proper operation of all smoke and fire dampers, sensors, detectors, installed as component parts of air system specified in other Divisions.
- .4 Measurement of noise and vibration from equipment specified in Mechanical Division.
 - .1 Vibration measurements around each piece of rotating equipment.
 - .2 Sound measurements in each octave band around each piece of rotating equipment.
 - .3 Induct sound measurements in each octave band at each fan inlet and discharge.
 - .4 Induct sound measurements in each octave band at each air handling unit intake, return and discharge.
 - .5 Sound measurements in each octave band for each normal occupied room with air handling equipment running.

END OF SECTION