

1. **General Information**

1.1 **Summary**

- .1 This section covers the operations, methods, in addition to the testing, adjusting and balancing (TAB) requirements of HVAC systems.
- .2 The TAB operations are operations for testing, adjusting and balancing to ensure that the various systems operate in accordance with the requirements set out in the contract documents. TAB operations also include all other work described in this section.

1.2 **Qualification of TAB operations staff**

- .1 Submit the list of individuals who will be responsible for performing the testing, adjusting and balancing operations to the Engineer within 90 days of contract allocation.
- .2 Submit documentation to confirm the competency and experience of the staff.
- .3 The testing, adjusting and balancing operations will be performed in accordance with the requirements of the standard governing the company's qualification and the staff responsible for them.
 - .1 Associated Air Balance Council, (AABC), National Standards for Total System Balance, MN-1 in effect.
 - .2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems in effect.
 - .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing in effect.
- .4 TAB operations must be performed according to the recommendations and practices suggested in the adopted standard.
- .5 In order to meet the contractual requirements, comply with the requirements of the standard adopted for TAB operations and use the checklists and forms proposed therein.
- .6 Comply with the requirements of the adopted standard for TAB operations, including the qualification of the company and the staff responsible for the work and the calibration of the measuring instruments used.
- .7 Comply with the measuring instrument manufacturer's recommendations for

calibration when they are more stringent than the recommendations in the TAB Standard.

- .8 The requirements of the selected quality assurance standard, including performance guarantees, form an integral part of this contract.
 - .1 In the case of systems or components not covered by the adopted standard for TAB operations, use the methods developed by the specialist in charge of the work.
 - .2 When new methods and requirements are applicable to the contractual requirements and have been published or adopted by the responsible authority (AABC, NEBB, or TAB) of the standard adopted for testing, adjusting and balancing, the requirements and recommendations are therefore defined are mandatory.

1.3 TAB purpose of operations

- .1 Test systems to verify that they are operating safely and appropriately, to determine the actual operating point and to assess the qualitative and quantitative performance of the devices, systems and associated control / regulation devices, and at nominal load, medium load or low load, this load being real or simulated.
- .2 Adjust the equipment and systems to meet the prescribed performance requirements and to interact in the prescribed manner with other related systems under load conditions, in addition to normal and emergency operating conditions.
- .3 Balance the devices and systems so that the flow rate matches the load over the entire operating range.

1.4 Specific standards and codes

- .1 Testing, adjusting and balancing of equipment and systems governed by particular standards or codes shall be carried out to the satisfaction of the competent authorities.

1.5 Coordination of work

- .1 Allow for time, within the construction schedule, for the testing, adjusting and balancing of systems (including repairs and test retries), which must be completed prior to the acceptance of work.
- .2 Test, adjust and balance each separate system, then each system in relation to related systems, in the case of slave systems.

- 1.6 Review of the terms of the contractual documents relating to the TAB operations**
- .1 During construction, coordinate the location and installation or layout of devices, appliances, accessories, openings, and measurement fittings required to perform TAB operations.
- 1.7 Start-up of the devices and systems**
- .1 Unless otherwise specified, follow the manufacturer's recommended start-up procedures for the devices and systems.
 - .2 Follow any special start-up procedures prescribed elsewhere in Division 23.
- 1.8 Operation of devices and systems during TAB operations**
- .1 Operate the devices and systems for the time required to perform the TAB operations and for the time required by the Engineer to verify TAB reports.
- 1.9 TAB start of operations**
- .1 Notify the Consultant seven (7) days prior to starting the testing, adjusting and balancing.
 - .2 Undertake TAB operations only when the most of the building is usable, either when:
 - .1 The completion of ceilings and the installation of doors, windows and other construction elements that may affect the outcome of operations have been completed;
 - .2 The installation of sealants, caulking and weatherstripping is complete;
 - .3 The pressure tests, leak tests and other tests prescribed in other sections of Division 23 have been completed;
 - .4 The equipment required to perform the TAB operations is installed and in good working order;
 - .5 The mechanical and related electrical and control systems that may affect the outcome of TAB operations are operating and have been verified to be functioning, which affects in particular the following elements.
 - .1 Thermal protection of electrical equipment against overloads, in place.
 - .2 Aeraulic networks
 - .1 Filters clean and in place.

- .2 Air ducts clean.
- .3 Conduits, ducts and plenums airtight within prescribed limits.
- .4 Ventilators turning in the correct direction.
- .5 Volumetric registers and fire and smoke dampers in place and open.
- .6 Coil fins, clean and straightened.
- .7 Doors and hatches installed and closed.
- .8 Air outlets installed and volumetric registers open.
- .3 Hydronic networks
 - .1 Pipelines rinsed, filled and vented.
 - .2 Pumps turning in the correct direction.
 - .3 Filters in place and baskets clean.
 - .4 Isolation and balancing valves in place and open.
 - .5 Balancing valves installed and calibrated according to the manufacturer's settings.
 - .6 Liquid treatment systems in good working order.

1.10 Discrepancies adjusted in relation to the theoretical values

- .1 Perform testing, adjusting, and balancing of systems to obtain results with no more than the following discrepancies, either less or more, from the theoretical values.
 - .1 Mechanical systems: more than 5%, less than 2%
 - .2 Hydronic systems: 5% for either more or less.

1.11 Differences between the measured values and the actual values

- .1 The measured values must correspond, within 2% for both more or less, with the actual values.

1.12 Measuring instruments

- .1 Calibrate instruments in accordance with the requirements of the most stringent standard or reference document for HVAC systems or others subject to TAB operations.

1.13 Documents/samples to be submitted

- .1 Before undertaking TAB operations, submit the following:
 - .1 The proposed method for performing the testing, adjusting and balancing of the systems if they differ from the method described in the standard or adopted reference document;

1.14 TAB report

- .1 The report presentation must comply with the requirements of the standard or the adopted reference document, in regards to the TAB operations.
- .2 The results must be expressed in SI units in the report, and the report must include the following:
 - .1 Drawings to be included in the project file;
 - .2 The schematic diagrams of the systems concerned.
- .3 Submit for verification and approval, one (1) copy of the TAB report, in French, in electronic format.

1.15 Data verification

- .1 The recorded measurements are likely to be verified by the Consultant.
- .2 The Engineer will determine the number of verifications to be made and the location of the measurement points.
- .3 Repeat the testing, adjusting and balancing until the results satisfy the Engineer and assume the cost of this work.

1.16 Adjustments

- .1 Once the TAB operations have been completed to the satisfaction of the Engineer, replace the guards of the drive or transmission components, close the doors and inspection hatches, lock the adjusting devices in the operating position and check if the sensors are set to the required setpoints.
- .2 Permanently mark the adjustment positions; these must not be erased or covered in any way.

1.17 TAB end of operations

- .1 The testing, adjusting and balancing of the systems will not be considered complete until the final report has been approved by the Engineer.

1.18 Aeraulic systems

- .1 The TAB operations must be carried out in accordance with the most stringent requirements set out in the relevant standards and reference documents.
- .2 The individuals who perform the TAB operations must be authorized to provide the prescribed services, in accordance with AABC or NEBB standards.
- .3 The readings to be made will include, in particular, the following, depending on the systems, devices, control elements or controls: air velocity, static pressure, flow, pressure drop (or fall pressure), temperature (dry bulb, wet bulb, dew point), section of air ducts, rotational speed, power demand, voltage, noise and vibration levels.
- .4 Measuring points, in the case of appliances, will mostly be located in the following locations, depending on the case:
 - .1 At the entrance and exit of dampers, filters, heating and cooling coils, humidifiers, fans and other appliances that cause changes in conditions;
 - .2 Regulators and controlled devices and appliances.
- .5 The measurement points, in the case of systems, will mostly be located in the following locations, as applicable: the main air ducts, the main and secondary bypass ducts and the supply ducts of the terminal elements (grates, dampers or diffusers).

1.19 Hydronic systems

- .1 For the purposes of this section, hydronic systems include heating and cooling systems that operate with liquids such as low pressure hot water, cold water, condenser water and glycolated water and others.
- .2 The TAB operations must be carried out in accordance with the most stringent requirements set out in this section or the relevant standards and reference documents from the AABC, SMACNA or ASHRAE.
- .3 Proceed with the testing, adjusting and balancing systems, devices, control and regulation elements and devices.
- .4 The individuals who perform the TAB operations must be members in good standing and possess the ability to provide the services, in accordance with AABC standards.
- .5 System testing, adjusting and balancing operations must be performed under the direction of a recognized supervisor with the ability to provide the prescribed services in accordance with AABC standards.

- .6 The readings to be made must relate, in particular, to the following, according to the systems, devices, elements or control and regulation devices concerned: static pressure, flow rate, pressure loss (or pressure drop), temperature, density, volumetric mass density, rotational speed, power demand, voltage, and noise and vibration levels.
- .7 Measuring points, in the case of appliances, will mostly be located in the following locations, depending on the case:
 - .1 At the entry and exit of the heat exchangers (primary and secondary sides), boilers, coolers, heating and cooling coils, humidifiers, cooling towers, condensers, pumps, pressure reducers, control and regulating valves, and any other device that causes changes in conditions;
 - .1 Regulators and control and regulation devices.
- .8 Measuring points, in the case of systems, shall be located, in particular, at the following locations, as applicable: the supply and return of primary and secondary loops (main pipelines, main and secondary service lines, supply lines for terminal elements of hydronic systems and intake fittings for make-up water circuits).

1.20 Other mechanical systems

- .1 Flush valves: Set according to prevailing pressure conditions.
- .2 Backflow prevention devices: Perform the tests and obtain the certificates, in accordance with the CAN/CSA-B64.10 standard.

1.21 Other requirements for TAB operations

- .1 General requirements for works or work described in this article
 - .1 Qualification of the staff responsible for the TAB operations: According to the requirements set out in the article regarding aeraulic systems.
 - .2 Quality assurance: According to the requirements set out in the article regarding aeraulic systems.
- .2 Pressure conditions in the building
 - .1 Adjust HVAC systems and equipment and associated control / regulation devices to achieve the prescribed operating pressure conditions at all times.
- .3 Inter-zone pressure differentials

.1 Adjust HVAC systems and equipment and associated control / regulation devices to achieve the prescribed air pressure differentials, regardless of the normal operating combinations of the systems and devices involved.

.4 Smoke control systems

.1 Verify the operation of the dampers, fire and smoke dampers, sensors and detectors, which are part of the ventilation systems prescribed in the aeraulic systems, Division 23.

1.22 TAB operations to be performed after moving

.1 Measure dry bulb temperature, wet bulb temperature (or relative humidity percentage), air velocity, air jet configuration, noise levels in the occupied zone of the following areas.

.2 Participate in complete emergency evacuation exercises.

2. Products

2.1 Not applicable.

3. Execution

3.1 Not applicable.

END OF SECTION