1. This information provides guidelines for testing, adjusting, and balancing (TAB) heating, ventilating, and cooling (HVAC) air and water distribution systems, including equipment, ducts, and piping, and sound and vibration measurements. Temporary facilities and controls are covered in other parts of these standards or are available from the Facilities Management (FM) project representative.

2. FM project representative, FM, Public, Safety Office, and Environmental Health and Safety Office shall approve selection of materials, means, and methods. Unless otherwise approved, the design intent requires means and methods that provide minimal disruption to adjacent building activities and operations.

3. When working in or adjacent to occupied buildings, require means and methods that protect occupants from exposure to noise, dust, traffic and other hazards.

4. FM project representative shall inform FM and other campus departments or groups affected by the work.

5. Definitions and abbreviations:
   a. HVAC – Heating, Ventilating and Air Conditioning/Cooling
   b. TAB – Testing, Adjusting and Balancing
   c. O&M – Operation and Maintenance
   d. NEBB – National Environmental Balancing Bureau

6. Preferred methods of accomplishing TAB work for projects at Western:
   a. Independent third party TAB contractor hired directly by Western. This method is used for substantial TAB work for public works projects.
   b. Utilize in-house Technical Maintenance personnel. This method is an option for simple systems where it is more economical to accomplish the work with in-house staff.

7. Early in the design phase, the project mechanical engineer shall select the most appropriate method of accomplishing the TAB work. The FM project representative, FM, and Technical Maintenance shall approve the method based on availability of budget and manpower resources.

8. Quality assurance:
   a. Require all independent TAB contractors to be NEBB certified.
   b. The project mechanical engineer shall review all phases of TAB design and construction work.
   c. Technical Maintenance shall review all phases of TAB design and construction work.
   d. Require the mechanical construction subcontractor to verify all system components are installed and operational prior to TAB field work.
   e. Owner reserves the right to require all air and water distribution measurements from the final balancing report to be verified by the TAB contractor, at no additional cost, through a random 10% selection of equipment, terminals or devices.
   f. For public works projects using an independent TAB contractor, require the final balancing report to be certified and signed by the TAB firm’s designated NEBB supervisor.
   g. Require calibration certificates for TAB equipment (within 12 months of TAB work) to be included in the final balancing report.
9. Reports: All reports shall be submitted to the FM project representative for review and approval by the project mechanical engineer and Technical Maintenance.
   a. Design review report: Prior to construction of mechanical systems, the TAB contractor shall review the design and prepare the report.
   b. Preliminary checklist report: After systems are installed and operating, the mechanical construction subcontractor shall prepare the report. The report shall be reviewed by the TAB contractor prior to submittal. Verify all balancing devices are adjusted to the full wide open position prior to the commencement of TAB field work. Document any concerns with systems/components that may not meet design requirements.
   c. Preliminary balancing report: After completion of TAB field work, the TAB contractor shall prepare the report for preliminary review.
   d. Final balancing report: After resolution of preliminary review comments, and verification that all systems have been balanced to within design specifications, the TAB contractor shall prepare the final balancing report. The construction contractor shall incorporate the final approved report in the project O&M manual. The final balancing report shall include an executive summary at the front that addresses the following topics:
      i. Overview narrative of the system.
      ii. Identify the operational mode the system was in for balancing.
      iii. Explain how different zones were balanced if the system is designed with load diversity.
      iv. List any parameters that didn’t meet design requirements.
      v. List any authorized deviations required to resolve non-compliance issues.

10. Balancing valves:
   a. Require all valves to be designed to ensure manufacturer’s minimum straight length of piping upstream and downstream of valve.
   b. Prohibit factory set automatic balancing valves. All valves shall be field adjustable.
   c. Require balancing valves for all heating and cooling coils.
   d. Require balancing valves for all HVAC pumps.
   e. Prohibit use of balancing valve for isolation.
   f. Avoid triple duty balancing valves. Prefer separate isolation, check and balancing valves.
   g. Clearly field mark setting for final acceptable testing and balancing.

11. Belt sheaves:
   a. See “DIVISION 23 Air Distribution, Ventilation, and Exhaust Systems” for requirements for final fixed sheaves on air handling equipment.
   b. Require the mechanical construction subcontractor to replace all variable pitch sheaves in rotating equipment to fixed pitch sheaves after final balancing.

12. Balancing dampers:
   a. Require balancing dampers to be shown on drawings at all branches from main duct, and at each terminal branch duct.
   b. Require locking quadrant type volume dampers.
   c. Clearly mark setting for final acceptable testing and balancing.

13. Sound and vibration:
   a. Require vibration isolation provisions for all rotating equipment.
   b. Require certified sound and vibration measurements for all equipment greater than 5 hp at each octave band. Verify compliance with maximum design requirements.
c. Sound readings shall be repeatable and locatable and taken at a minimum of 10% of room
   locations and as directed by the FM project representative and the project mechanical
   engineer.

d. See “DIVISION 20 General Mechanical Requirements” and “WWU Design Guide
   Acoustical Standards” web link for additional requirements.

14. The following minimum information shall be shown on project drawings to facilitate balancing:
   a. A unique number or mark for each terminal and piece of equipment.
   b. Air quantities at air terminals.
   c. Air quantities and temperatures in air handling unit schedules.
   d. Minimum outside air quantities.
   e. Maximum outside air velocity across free area of outside air intake louvers.
   f. Water quantities and temperatures in heat transfer equipment schedules.
   g. Water quantities and pressure heads in pump schedules.
   h. Accessible air and water flow measuring devices.
   i. Maximum sound levels for each piece of equipment, terminal and room.
   j. Maximum vibration levels for each piece of equipment.
   k. A table for sizing of balancing valves based on flow rate and pressure.

End