

DIVISION 15 - MECHANICAL

Section 15990 - Testing, Adjusting And Balancing

Introduction

Acceptance testing during construction and achieving an acceptable final air and water balance are critical elements of project completion. It is therefore extremely important that the balancing and the associated report be accomplished and submitted before or at the time of substantial completion. Similarly, timely reviews by the Consultant/UA will insure that the final balance is acceptable prior to occupancy.

Part 1 – General

- Ductwork Acceptance Testing
 - Test pressure for ductwork shall be at the design pressure class for the system.
 - Ductwork downstream of terminal units and ductwork with a design pressure less than 1 iwg may be approved via visual inspection by the University.
 - Testing to be per the latest edition of The SMACNA Air Leakage Testing Manual. If more stringent requirements are required discuss with PDC Mechanical Engineer and include requirements in the project construction documents.
 - Orifice tube to be provided of appropriate size to show allowable leakage within the calibrated range of the tube.
 - All tests to be witnessed by PDC Inspector.
 - Chart for converting pressure to volume shall be specific for the device used in testing.
 - If sample testing is allowed – the test sections will be randomly selected by the UA inspector from completed work.
- Piping Systems Acceptance Testing
 - Test all fire protection systems in accordance with all applicable NFPA Codes.
 - Piping to be inspected and pressure tested prior to insulation.
 - All pressurized piping systems tests to be for a 4 hour duration.
 - Gravity drainage systems test to be a 2 hour duration.
 - Pressure gauge for the test must have a suitable range such that the test pressure is in the middle 1/3 of the range.
 - All tests to be witnessed by PDC Inspector.
 - No loss of pressure allowed for all testing.
 - Gravity systems to be tested at 10ft hydraulic head or 5psig pneumatic if approved by the inspector.
 - Domestic water to be tested at 100psig.
 - Mechanical hydronic piping shall be tested to 150 psig.
 - Low pressure steam to be tested at 150 psig.
 - High Pressure stem to be tested at 200 psig.
 - Laboratory gas piping to be tested at 150psig.
- Vibration Testing
 - Vibration testing to be performed on all rotating equipment 3 horsepower and above in accordance with AABC Standards.
 - Equipment shall have a maximum vibration velocity reading no greater than 0.04in/sec.
- Fume Hood Testing: Discuss With UA Planning Design & Construction
 - Each fume hood shall be identified with a plaque indicating the location and number of exhaust fan serving the hood.
 - Each exhaust fan shall be identified with a weather-proof plaque indicating the location(s) of the fume

hood(s), by room number (s), that the fan serves.

- **Air Systems**

- All work shall be in accordance with latest edition AABC, NEEB Standards and applicable sections of ASHRAE and SMACNA HVAC systems testing, adjusting and balancing procedures.
- Air volumes measured shall be within $\pm 10\%$ of those shown on drawings unless otherwise specified for diffusers, grilles, registers where applicable and fans.
- Ensure all temperature sensors and controls are calibrated prior to conducting test and balance procedures.
- At the time of final inspection, recheck in the presence of the University and Design Professional, random selections of air quantities and fan data recorded in the certified report. Points or areas for recheck shall be selected by the University and Design Professional and be approximately 10% of the report data.
- At the time of verification measure space temperature and humidity in a representative number of rooms to verify performance. Tabulate these results and bind into certified report as an appendix.
- Testing to be conducted on a hierarchical principal, i.e. each piece of equipment for proper operation, followed by each sub-system followed by entire system, followed by inter-ties to other major systems.
- Following final acceptance of the certified reports by the Design Professional, permanently mark the settings of all valves, dampers and other adjustable devices so that balance set position can be restored if disturbed at any time. Do not mark such devices until after final acceptance.
- VFD controlled fan systems to be tested in bypass mode to verify satisfactory operation of static pressure high limit sensor.

- **Piping Systems**

- Balance the entire water system to ensure all coils, heat exchangers, etc., are operating to design conditions. Adjust the circuits by means of the balancing valves and record balance position.
- Each pump shall be checked for design, working and shut-off head conditions and any pump that varies by more than 10% from the design conditions shall have the impeller trimmed or changed until design conditions have been met.
- Flow through all heat exchangers, chillers, boilers and other such equipment shall be balanced to ensure that the pressure drop through the equipment is within 10% of the manufacturer's design conditions.
- If the design conditions cannot be met by adjusting the balancing valves throughout the system, then pump impellers shall be either changed or trimmed as required.
- Initial balancing of coils shall be to ensure that the pressure drops are within 10% of the manufacturer's design conditions. When both the air and water systems are fully operational, entering air and water and leaving air and water readings shall be taken as close as possible to the peak design conditions to ensure the coil performance meets the design conditions. Coil water working conditions shall only be taken in conjunction with the air flow working conditions for the coil.
- Coordinate with the Contractor to ensure that all necessary valves for control and balancing are installed in all locations required. Notify the University and Design Professional in writing that this coordination has taken place. Include in this letter any recommendations made regarding valves, locations, installation, etc.
- Testing to be conducted on a hierarchical principal, i.e. each piece of equipment for proper operation, followed by each sub-system followed by entire system, followed by inter-ties to other major systems.
- Following final acceptance of the certified reports by the University and Design Professional, permanently mark the setting of all valves and other adjustable devices so that balance set position can be restored if disturbed at any time. Do not mark such devices until after final acceptance.

- **Part 2 - Products**

- No Discussion.

- **Part 3 – Execution**

- All required balancing shall be completed and the final report submitted as a condition of substantial completion.

End of Section 15990