

Appendix A – Sample Specification Section

I. VENTILATION VERIFICATION ASSESSMENT

SECTION 00 00 01

PART 1 GENERAL

1.01 SECTION INCLUDES:

- A. Ventilation Verification Assessment of:
 - 1. Air conditioning equipment including Heating, Ventilation, and Air Conditioning (HVAC) systems, air distribution devices, supply ducts, return ducts, exhaust ducts, air handling units, condensing units, fans, coils, and related equipment.
 - 2. Hydronic systems including pumps, water distribution systems, chillers, boilers, heat exchangers, coils, and related equipment.

1.02 REFERENCES

- A. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) 111 – Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
- B. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) – TAB Procedural Guide – Endorsed by Testing, Adjusting and Balancing Bureau (TABBB)
- C. Associated Air Balance Council (AABC) – National Standards for Total System Balance.
- D. National Environmental Balancing Bureau (NEBB) – Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

1.03 DEFINITIONS

For purposes of this article, the following definitions apply:

- A. "ANSI" means American National Standards Institute.
- B. "Certified TAB Technician" means a technician certified to perform testing, adjusting, and balancing of HVAC systems by the Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB), or the Testing, Adjusting and Balancing Bureau (TABBB).
- C. "Design Professional" means a licensed mechanical engineer, certified industrial hygienist (CIH), or mechanical Design Professional as defined by state or provincial guidelines.
- D. "HVAC" means heating, ventilation, and air conditioning.
- E. "MERV" means minimum efficiency reporting value, as established by the current edition of ASHRAE Standard 52.2 – 2017 – Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
- F. "ppm" means parts per million.

- G. "Qualified Testing Personnel" means either of the following:
 - 1. Certified TAB Technician; or
 - 2. A person certified to perform ventilation assessments of heating, ventilation and air conditioning system through a certification body accredited by ANSI.
- H. "Skilled and trained workforce" means a workforce where a majority of the construction workers are graduates of a registered apprenticeship program for the applicable occupation.
- I. "TAB" means testing, adjusting, and balancing of a HVAC system.

1.04 SUBMITTALS

A. Reports:

1. Ventilation Verification Report: Submit the complete Ventilation Verification report to a Design Professional for review. Report shall include any drawings indicating air outlets, thermostats, and equipment identified to correspond with data sheets.
 - a. Reports shall be on TABB/SMACNA, AABC, or NEBB forms that indicate information addressing each of the testing methods, readings, and adjustments.
 - b. Reports may utilize attached sample forms, provided they include clear identification of the company providing the service as well as being stamped by an industry recognized certifying agency.
2. Following Repairs, Adjustments, Replacements and Upgrades prepare and submit a final HVAC Verification Report. The final HVAC Verification Report shall have the following components:
 - a. Verification that either MERV 13 filters have been installed or verification that the maximum MERV-rated filter that the system is able to effectively handle has been installed and identify what that MERV-rating is.
 - b. The verified ventilation rates for each facility meet the requirements set forth in the current version of the applicable ASHRAE 62 standard for Acceptable Indoor Air Quality or current locally adopted Mechanical Code, whichever is more stringent, during occupied periods. If ventilation rates do not meet applicable guidance, then an explanation for why the current system is unable to meet those rates shall be provided.
 - c. The verified exhaust for occupied areas and whether those rates meet the requirements set forth in the design intent.
 - d. Documentation of repairs, upgrades or replacements performed pursuant to the HVAC Assessment Report and Design Professional recommendations, including all work performed.
 - e. Verification of installation of carbon dioxide monitors, including make and model of monitors.
 - f. Verification that all work has been performed by qualified personnel, including the provision of the contractor's name, TAB technician

name and certification number, and verification that all construction work has been performed by a skilled and trained workforce.

- g. At a minimum, the Design Professional must provide a cover letter, with their credentials, documentation of remaining deficiencies and a plan for continued maintenance, repairs, replacement, or upgrades to improve energy efficiency, safety, or performance.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Ventilation Verification shall be performed by Qualified Testing Personnel.
2. Adjustments to the HVAC system shall be performed by a Certified TAB Technician.
3. All HVAC ventilation verification, adjustments, repairs, upgrades, or replacements shall be performed by a skilled and trained workforce.

PART 2 EXECUTION

2.01 EXAMINATION

A. Ventilation Verification testing shall include all of the following (if applicable):

1. Ventilation Verification Assessment

- Filtration** - Use a combination of filters and air cleaners that achieve Minimum Efficiency Reporting Value (MERV) 13, or better, levels of performance for air recirculated by HVAC units. Qualified Testing Personnel shall review system capacity and airflow to determine the highest MERV filtration that can be installed without adversely impacting equipment. A Design Professional can recommend further mitigation if MERV 13 is not feasible with the existing HVAC equipment.
- Ventilation Rate** - Ventilation Rate - Building systems can operate to provide the minimum ventilation rate requirements, during occupied periods, set forth in the current version of the applicable ASHRAE 62 standard for Acceptable Indoor Air Quality or current locally adopted Mechanical Code, whichever is more stringent. A Design Professional shall assess and determine the minimum required ventilation rate based on actual use and occupancy. Qualified Testing Personnel shall physically measure and verify the established minimum ventilation rate. A Certified TAB Technician shall adjust the actual values, if needed, to within a tolerance of +/- 10% of the determined design values.
 - ASHRAE Standard 62.1 Ventilation for Acceptable Indoor Air Quality
 - ASHRAE Standard 62.2 Ventilation and Acceptable Indoor Air Quality in Residential Buildings.
- Ventilation System Operation** - Physically test all ventilation components for proper operation.
- Air Distribution** - Survey all inlets and outlets. Inaccessible individual inlet and outlet measurements, serving auditoriums, theaters, and gymnasiums, are not required, and may be verified by system or branch totals. Verify all ventilation

is reaching the served zone and there is adequate distribution.

- **Building Pressure** - Verify the building pressure is per design and a negative pressure is maintained for contaminant rooms temporarily occupied by sick occupants.
- **Operational Controls** - Review control sequences to verify systems will maintain intended ventilation, temperature, and humidity conditions during building operation. Verify a daily flush is scheduled in accordance with current ASHRAE recommendations and any applicable local or state guidance.
- **CO2 Monitoring** - As an indicator of proper ventilation throughout building occupation, all occupied areas shall be equipped with a CO2 monitor within each zone of the building.
- **Limited or No Existing Mechanical Ventilation** - In cases where there is limited or no existing mechanical ventilation, the assessment would then focus on available options and provide the Design Professional with documentation to provide ventilation options.

2. Design Professional Review – Submit the Ventilation Verification assessment report, with clearly noted deficiencies, to a qualified Design Professional (licensed mechanical engineer, certified industrial hygienist (CIH), or mechanical Design Professional as defined by state or provincial guidelines).

- At the advice of the Design Professional, In-Room HEPA air cleaners may be considered as a supplemental component of central HVAC systems or as temporary mitigation until installation of a permanent solution. HEPA air purifiers shall be selected according to current ASHRAE Guidelines.¹

3. Repairs, Adjustments, Replacements and Upgrades – Work with the Design Professional to determine cost effective options to improve ventilation, filtration, and energy efficiencies for the building occupants that depend on a healthy learning or working environment.

4. HVAC Verification Report - Prepare and submit a final HVAC Verification Report.

2.02 AIR SYSTEMS PROCEDURE

A. Adhere to one of the following procedures:

1. TABB – SMACNA TAB Procedural Guide, with particular focus on the following chapters:
 - a. Preliminary TAB Procedures.
 - b. General Air System TAB Procedures.
 - c. TABB Procedures for Specific Air Systems.
2. AABC – National Standards for Total System Balance.
3. NEBB – Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

2.03 HYDRONIC SYSTEMS PROCEDURE

¹ ASHRAE, In-Room Air Cleaner Guidance for Reducing COVID 19 in Air in Your Space/Room. (January 21, 2021) (<https://www.ashrae.org/file%20library/technical%20resources/covid-19/in-room-air-cleaner-guidance-for-reducing-covid-19-in-air-in-your-space-or-room.pdf>)

- A. Adhere to one of the following procedures:
1. TABB – SMACNA TAB Procedural Guide, with particular focus on the following chapter:
 - a. Hydronic System TAB Procedures.
 2. AABC – National Standards for Total System Balance.
 3. NEBB – Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

2.04 ADJUSTING

- A. Recorded data shall represent actual measured or observed conditions. Adjustments are to be done only by certified testing, adjusting, and balancing technicians after consultation with a Design Professional.

II. MAINTENANCE

SECTION 00 00 02

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preventative Maintenance Assessment of:
1. HVAC Systems

1.02 REFERENCES

- American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Standard 62.1 – 2019 Ventilation for Acceptable Indoor Air Quality
 - Section 8. Operations and Maintenance
 - Table 8.1 Minimum Maintenance Activity and Frequency

1.03 DEFINITIONS

For purposes of this article, the following definitions apply:

- A. “Certified TAB Technician” means a technician certified to perform testing, adjusting, and balancing of HVAC systems by the Associated Air Balance Council (AABC), National Environmental Balancing Bureau (NEBB), or the Testing, Adjusting and Balancing Bureau (TABB).
- B. “HVAC” means heating, ventilation, and air conditioning.
- C. “Skilled and trained workforce” means a workforce where a majority of the construction workers are graduates of a registered apprenticeship program for the applicable occupation.

D. "Qualified Testing Personnel" means either of the following:

1. Certified TAB Technician; or
2. A person certified to perform ventilation assessments of heating, ventilation and air conditioning system through a certification body accredited by ANSI.

1.04 SUBMITTALS

A. Preventative Maintenance List and Agreement

1. Establish a Preventative Maintenance List and Agreement with a vendor who utilizes a skilled and trained workforce. Minimum HVAC and maintenance agreement shall be in accordance with ASHRAE 62.1 – 2019 Section 8 Operations and Maintenance and Table 8.1 Minimum Maintenance Activity and Frequency. The maintenance procedure shall be followed regardless of the age of the building, ventilation system, components, or renovations.
2. Submit signed agreement.

B. Maintenance logs must be kept and include date, time, name of person conducting the work, qualifications of the technician performing the work, and what work is being done.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. HVAC Preventative Maintenance, adjustments, repairs, upgrades, or replacements shall be performed by a skilled and trained workforce.
2. Verification of ventilation rates shall be performed by Qualified Testing Personnel.
3. Adjustments to the HVAC system shall be performed by a Certified TAB Technician.

PART 2 EXECUTION

2.01 EXAMINATION

A. Qualified contractor shall develop a site-specific HVAC Preventative Maintenance schedule in accordance with ASHRAE 62.1 – 2019 Section 8 Operations and Maintenance and Table 8.1 Minimum Maintenance Activity and Frequency.

B. The following maintenance verifications and procedures shall be included along with the scheduled general maintenance.

1. Verification of the ventilation rate must take place after major alterations or change of use, as defined in Section 8.1.2 of ASHRAE 62.1 – 2019, at a frequency not to exceed 5 years per Table 8-1 ae. All units shall be tested regardless of the total cfm of supply air.
2. Verify the accuracy and operation of the CO2 sensors, at a frequency not to exceed 5 years per Table 8-1 ad.

3. If a facility's carbon dioxide concentration exceeds 1,100 ppm more than once a week as observed by the facility staff, the corresponding ventilation rates shall be adjusted by Certified TAB Technician, to ensure that peak carbon dioxide concentrations in the zone remain below the maximum allowable carbon dioxide ppm set point. Facilities shall keep a log of all incidents where the carbon dioxide concentration exceeds 1,100 ppm.
4. Maintenance must include reviewing previous TAB reports to confirm any changes and that established setpoints are maintained.
5. Review of Maintenance log from previous service to ensure deficiencies have been addressed.

END OF SECTION