

STANDARD

ANSI/ASHRAE/ACCA Standard 180-2012
(Supersedes ANSI/ASHRAE/ACCA Standard 180-2008)

Standard Practice for Inspection and Maintenance of Commercial Building HVAC Systems

See Informative Appendix D for approval dates by the ASHRAE Standards Committee, the ASHRAE Board of Directors, Air Conditioning Contractors of America, and American National Standards Institute.

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ISSN 1041-2336



ASHRAE Standing Standard Project Committee 180
Cognizant TCs: Lead Cognizant TC 7.3, Operation and Maintenance Management;
Co-Cognizant TC 2.4, Particulate Air Contaminants and Particulate Contamination Removal Equipment;
and Co-Cognizant TC 9.8, Large Buildings Air-Conditioning Applications
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NOTE

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(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

FOREWORD

ANSI/ASHRAE/ACCA Standard 180-2012 is the latest edition of Standard 180. The 2012 edition combines Standard 180-2008 and approved and published Addendum a to the 2008 edition, thereby providing an easy-to-use consolidated standard. Specific information on the contents of the addendum and the approval dates are included in Informative Appendix D.

This 2012 edition was updated using the continuous maintenance process. A thorough review of the standard under the continuous maintenance process resulted in improvements, revisions, and updates to the tables in Section 5. The changes were deemed necessary in order to eliminate duplication, add additional tasks, list equipment tables in alphabetical order for easier reference, and consolidate similar equipment where appropriate.

The 2012 edition will be updated on a five-year cycle using the periodic maintenance process.

Standard 180 was created in a collaborative effort between ASHRAE and Air Conditioning Contractors of America (ACCA). Its intent is to address the often inconsistent practices for inspecting and maintaining HVAC systems in commercial, institutional, and other buildings where the public may be exposed to the indoor environment. Current practices in such buildings vary widely. Many facilities choose to follow rigorous policies that maintain the system in new or nearly new condition. Others either lack policy in this area or have adopted a run-to-failure approach, where the system or components of the system are attended to only when there is a failure.

To provide consistency and improve the thermal comfort, energy efficiency, and indoor air quality of commercial HVAC systems, a standard practice for their inspection and maintenance is needed. When there is no routine inspection and subsequent adjustment or maintenance of system components, the system is typically found operating outside its optimum performance parameters. When systems are not maintained, they do not continue to provide the level of work they were designed for.

A standard practice is also needed to guide maintenance of HVAC systems because the maintenance information often provided by manufacturers applies only to the discrete components that they provide rather than to the entire system. This document considers the integration of those components and the way they interact as well as each component separately.

For the public good, it is essential that the HVAC systems in all buildings where persons work, visit, or reside support a high-quality indoor environment. In addition,

sustainability mandates that those conditions be maintained in as energy efficient a manner as possible.

This document describes the minimum acceptable level of maintenance for commercial building HVAC systems. Other standards or guidance documents may establish more specific or rigorous requirements that apply to certain buildings. Where applicable, those requirements should be followed or considered (if guidelines). This document is not intended to limit the level of service provided or recommendations made by a service provider. Those delivering HVAC maintenance are encouraged to consider and recommend energy conservation measures or technology improvements that would help maintain or increase thermal comfort, the energy efficiency of the HVAC system, and indoor air quality.

Much of the information that will be required to prepare the maintenance program that is mandated by this standard can most conveniently be obtained from the building commissioning (recommissioning or retrocommissioning) documents. Although recommissioning is not a requirement of this standard, it should be considered where the commissioning data is either unavailable or outdated. Additionally, ASHRAE Guideline 4, Preparation of Operating and Maintenance Documentation for Building Systems, and ASHRAE Guideline 32, Sustainable, High-Performance Operations and Maintenance, may be helpful to practitioners seeking to develop or expand maintenance programs. ASHRAE continues to provide industry reference documents and is in process of preparing other guidelines on commissioning and training. Refer also to this standard's Informative Appendix C, Bibliography, which lists many reference documents by ASHRAE and other organizations as well as industry technical papers and publications. Some of these documents include ideas toward "Best Practices" or "Reliability-Centered" or other means and methods above the minimum standard.

This standard is written in code-intended language so it may be referenced or adopted by enforcement authorities as the minimum acceptable level of performance within their jurisdictions.

Note: *This standard is specifically focused on the impacts of maintenance on occupant thermal comfort, energy efficiency, and indoor air quality. Additional maintenance program considerations related to equipment reliability, equipment robustness, and minimizing overall maintenance costs are also appropriate in order to support sustainability efforts, protect the HVAC capital investment, and/or minimize system downtime. These considerations, however, are outside the scope of this standard.*

1. PURPOSE

The purpose of this standard is to establish minimum HVAC inspection and maintenance requirements that preserve a system's ability to achieve acceptable thermal comfort, energy efficiency, and indoor air quality in commercial buildings.

2. SCOPE

2.1 This standard provides minimum requirements for the HVAC system inspection and maintenance practice in new and existing buildings. Where specifically noted in this standard, different requirements apply.

2.2 The provisions of this standard do not apply to:

2.2.1 Single-family houses or multi-family structures of three or fewer stories above grade.

2.2.2 HVAC equipment and portions of building systems that primarily provide for industrial, manufacturing, or *commercial processes*.

2.2.3 Other building HVAC systems or elements of building HVAC systems that this standard specifically identifies.

2.3 This standard shall not be used to circumvent any safety, health, or environmental requirements.

3. DEFINITIONS

Many of the terms used in this standard practice are defined in *ASHRAE Terminology of Heating, Ventilation, Air-Conditioning, and Refrigeration*. Additional terms used in this standard are defined below.

basis of design: a guidance document that stipulates or lists the desired or intended function and performance of the HVAC system. It lists the needs, requirements, flexibility, efficiency, limits, performance, desired condition, etc., of the space served by the HVAC systems, and it is intended to communicate this information from the HVAC system designer to the HVAC systems owner to the operator or to subsequent owners and operators.

building management system (BMS): an energy management system relating to the overall operation of the building in which it is installed. It often has additional capabilities, such as equipment monitoring, protection of equipment against power failure, and building security. It may also be a direct digital control (DDC) system where the mode of control uses digital outputs to control processes or elements directly.

commercial building: includes but is not limited to governmental and educational facilities, healthcare and hospitality facilities, institutional buildings, offices, places of assembly, restaurants, and buildings for retail and wholesale businesses.

commercial HVAC: any nonresidential or nonprocess or manufacturing-related HVAC application, including but not limited to applications for governmental and educational facilities, healthcare and hospitality facilities, institutional buildings, offices, places of assembly, restaurants, and retail and wholesale businesses.

commercial process: a process used primarily to produce, process, or hold material goods or works, such as cold food storage, painting, equipment assembly or repair, clothing assembly or cleaning, etc. It is used in manufacturing, assembly, repair, conditioned storage, and treatment systems.

inspection frequency: the time period or interval in which occurrences of a task or observations of a condition are to be

made. The period of inspection frequency may be based on timed intervals (i.e., weekly, monthly, quarterly, or annually), on hours of usage (“run time”), or system condition (“condition-based maintenance” determined from physical inspection or controls-based system alarms).

inspection or maintenance task: a well-defined unit of work that can be described by a sequence of instructions. Typical examples of such tasks include cleaning, calibration, visual inspection or observation, measurement, and lubrication.

maintenance program: a maintenance concept or approach that defines how maintenance will be performed for a specific facility in terms of time and resource allocation. It documents the maintenance objectives, establishes the criteria for evaluation, and commits the maintenance department to basic goals of performance, such as prompt response to mechanical failure and maintenance requirements.

performance: a measure of the success of an HVAC system in achieving thermal comfort, energy efficiency, and indoor air quality.

performance objective: the metrics for evaluating performance. They include written statements of performance, descriptions of normal operating characteristics, and measurable and observable indicators that are the basis for evaluating or inspecting elements of a system.

verification: confirmation by examination or commissioning that a specified requirement has been fulfilled. Typically verification requires independent reviewing, inspecting, examining, measuring, testing, checking, witnessing, monitoring, or otherwise establishing and documenting that products, processes, services, and documents conform to specified requirements.

4. IMPLEMENTATION

4.1 Responsible Party. The building owner shall be responsible for meeting the requirements of this standard. The owner may designate other parties that shall be authorized and contractually obligated to fulfill the owner’s responsibility.

4.2 Maintenance Program. Each HVAC system shall have a *maintenance program* that, at a minimum, preserves the condition of the HVAC system and its elements in a manner that enables the system to provide the intended thermal comfort and energy efficiency and helps to achieve the intended indoor air quality required for the building.

At a minimum, the *maintenance program* shall contain an inventory of equipment and systems to be inspected and maintained and a maintenance plan describing the goals, objectives, and execution of the HVAC systems *maintenance program*.

4.2.1 Inventory of Items to be Inspected and Maintained. Components of HVAC systems that impact the building’s *performance* shall be inventoried. This detailed list shall be used to establish unacceptable system condition indicators, *inspection frequencies*, and *maintenance tasks*.

4.2.2 Maintenance Plan Development. For any given facility, the maintenance plan shall be written and developed

specifically to meet the size, design, scope and complexity of the system(s) serving that facility.

The plan shall describe each required task, identify the party responsible for performing the task, specify the authorizing party, document its completion, and subsequently monitor the results.

The plan shall include all of the following information.

4.2.2.a Performance Objectives. Performance objectives shall incorporate thermal comfort, energy efficiency, and indoor air quality metrics. Performance objectives shall be based on basis of design and operational criteria specific to a particular system. The source of the performance objectives shall be documented; Informative Appendix A lists some of the possible sources that can be used to establish performance objectives.

4.2.2.b Condition Indicators. Indicators of unacceptable system and equipment conditions shall be established. These indicators are measurements or observations of conditions that could lead to failure or *performance* degradation. See Informative Appendix B for examples of unacceptable system condition indicators.

4.2.2.c Inspection and Maintenance Tasks. *Inspection and maintenance tasks* for inventoried equipment and systems shall be established. *Inspection* shall include the condition assessment of systems and/or their components by observation and/or measurement of operating parameters and may include data provided by sensors or a *building management system (BMS)*. *Maintenance tasks* shall include adjustment, service, or replacement of inventoried equipment and systems. See Section 5 for tables of required *inspection* and *maintenance tasks* by equipment type.

4.2.2.d Inspection and Maintenance Task Frequencies. Frequency of *inspection* and *maintenance tasks* for inventoried equipment and systems shall be established. If unacceptable condition indicators or unacceptable *performance* is found during two successive *inspections*, the owner, or owner's designated representative, shall investigate and analyze possible causes. At a minimum, the following possible causes shall be investigated.

- Poor field practices—review inspection documentation and/or technician execution to ensure *maintenance tasks* are performed correctly.
- Insufficient time budgeted for tasks—review time budgeted to the technician to ensure that reasonable time has been given to perform the tasks.
- Component repairs noted/pending/not made—inspect documentation to determine that repair or component replacement has been undertaken.
- Design issues—determine whether underlying design issues are causing successive failures.
- Obsolete equipment or components—determine whether the equipment or component has been in service beyond its useful life.
- Conditions outside of the HVAC system causing failure—investigate whether water leaks, vandalism, a problem in the building envelope, or some other external factor is causing the problem.

Based on the analysis, the *inspection frequency* or the *maintenance task* shall be modified to resolve the deficiency.

If acceptable condition indicators or acceptable *performance* is found during three successive inspections, then the *inspection frequency* for that task may be reduced from the existing frequency and/or the level of maintenance performed in the maintenance task may be reduced. The reduced frequency and/or maintenance shall be based on the specific findings and shall be documented.

Frequency may also be adjusted for climate-related or operational reasons. Examples would include the following:

- A cooling tower shutdown during the winter—Inspection and maintenance may be suspended during the shutdown period.
- A new chiller is installed and the old chiller is retained as a backup—Inspection and maintenance of the backup unit may be adjusted to reflect fewer operating hours.

Each adjusted frequency shall be documented, including the reason for the adjustment.

4.2.2.e Documentation. A minimum inspection and maintenance documentation package shall consist of the following items:

- a. listings of HVAC systems and system components with associated performance criteria pertinent to the facility,
- b. *inspection* and *maintenance tasks* and the method of tracking (automated or manual), and
- c. sufficient record detail and *verification* (written or electronic) to demonstrate implementation of the maintenance plan.

The inspection and maintenance document directory shall provide easy access and be well organized and clearly identified. Emergency information shall be immediately available and shall include emergency staff and/or agency notification procedures.

4.3 Maintenance Plan Authorization and Execution. *Inspection* and *maintenance tasks* shall be performed on an established frequency or upon a documented observance of unacceptable condition. Whether authorized by written or verbal instructions, execution of the task shall be documented and archived for future reference.

4.4 Revision of the Maintenance Program. The *maintenance program* shall be reviewed, and revision shall be considered in any of the following situations:

1. modifications to the building that impact HVAC *performance objectives* have occurred,
2. the building function or its use has changed in a way that impacts HVAC *performance objectives*,
3. HVAC component or HVAC system changes have occurred,
4. one or more systems are found to be incapable of achieving their *performance objectives*, and/or
5. upon documented recommendation from the maintenance provider.

5. REQUIRED INSPECTION AND MAINTENANCE TASKS

This section lists the required minimum *inspection* and *maintenance tasks* for any facility to which this standard applies. The *maintenance program* for the facility shall include at a minimum all of the listed *inspection* and *maintenance tasks* that apply to the HVAC systems and related equipment in the facility. The types of equipment and systems for which tasks are listed are as follows.

Table Number	Equipment/System
5-1	Air Distribution Systems
5-2	Air Handlers
5-3	Boilers
5-4	Chillers—Absorption
5-5	Chillers—Air Cooled
5-6	Chillers—Water Cooled
5-7	Coils and Radiators
5-8	Condensing Units
5-9	Control Systems
5-10	Cooling Towers and Evaporative-Cooled Devices
5-11	Dehumidification and Humidification Devices
5-12	Economizers—Air Side
5-13	Engines, Microturbines
5-14	Fans (e.g., Exhaust, Supply, Transfer, Return)
5-15	Fan-Coils, Hot Water and Steam Unit Heaters
5-16	Furnaces, Combustion Unit Heaters
5-17	HVAC Water Distribution Systems
5-18	Indoor Section Duct-Free Splits
5-19	Outdoor Air Heat Exchanging Systems
5-20	PTAC/PTHP (Package Terminal Air Conditioners or Heat Pumps)
5-21	Pumps
5-22	Rooftop Units
5-23	Steam Distribution Systems
5-24	Terminal and Control Boxes (e.g., VAV, Fan Powered, Bypass)
5-25	Water-Source Heat Pumps

To determine the required *inspection* and *maintenance tasks* for each subsystem or piece of equipment in a building, use the following procedure.

1. Referring to the HVAC equipment and systems inventory prepared as required in Section 4.2.1 of this standard, prepare a listing of the different equipment or subsystem types that exist in the building.
2. Using this list, identify from Tables 5-1 through 5-25 those that apply to the HVAC systems and equipment in the building.

If the HVAC system for the facility contains subsystems or equipment that is not found in the tables in this section, use inspection and maintenance items from tables for similar subsystems or equipment or create a new list of appropriate items.

3. At a minimum, the *maintenance plan* for the building shall include each of the *inspection* and *maintenance tasks* from all of the applicable tables.
4. The *maintenance program* may include other *inspection* and *maintenance tasks* to preserve the ability of the subsystem or equipment to achieve acceptable thermal comfort, energy efficiency, and indoor air quality.
5. This standard shall not supersede equipment manufacturers' instructions and guidelines that may require more frequent or increased tasks.

Note: In cases where manufacturers require more frequent tasks (or more tasks) than these tables show, this standard does not require its users to perform the additional maintenance to comply with the standard.

TABLE 5-1 Air Distribution Systems

Inspection/Maintenance Task	Frequency*
a Check control system and devices for evidence of improper operation. Clean, lubricate, repair, adjust or replace components to ensure proper operation.	Semiannually
b Visually inspect grilles, registers, and diffusers for dirt accumulation. Clean as needed to remove dirt build up.	Semiannually
c Assess field-serviceable bearings. Lubricate if necessary.	Annually
d Check for proper damper operation. Clean, lubricate, repair, replace, or adjust as needed to ensure proper operation.	Annually
e Visually inspect areas of moisture accumulation for biological growth. If present, clean or disinfect as needed.	Annually
f Visually inspect exposed ductwork for insulation and vapor barrier integrity. Correct as needed.	Annually
g Visually inspect internally lined ductwork until the first turn or up to 20 ft (6.1 m) from a potential moisture source, such as a supply plenum, from air handler, outdoor air damper, humidifier, etc. for water damage and/or biological contamination and, if necessary, take corrective action.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-2 Air Handlers

Inspection/Maintenance Task	Frequency*
a Check for particulate accumulation on filters. Clean or replace as necessary to ensure proper operation.	Quarterly
b Check ultraviolet lamp. Clean or replace as needed to ensure proper operation.	Quarterly
c Check control system and devices for evidence of improper operation. Clean, lubricate, repair, adjust, or replace as needed to ensure proper operation.	Semiannually
d Check P-trap. Prime as needed to ensure proper operation.	Semiannually
e Check fan belt tension. Check for belt wear and replace if necessary to ensure proper operation. Check sheaves for evidence of improper alignment or evidence of wear and correct as needed.	Semiannually
f Check variable-frequency drive for proper operation. Correct as needed.	Semiannually
g Check for proper operation of cooling or heating coil for damage or evidence of leaks. Clean, restore, or replace as required.	Semiannually
h Check air filter fit and housing seal integrity. Correct as needed.	Annually
i Check control box for dirt, debris and/or loose terminations. Clean and tighten as needed.	Annually
j Check motor contactor for pitting or other signs of damage. Repair or replace as needed.	Annually
k Check fan blades and fan housing. Clean, repair, or replace as needed to ensure proper operation.	Annually
l Check refrigerant system temperatures. If outside of recommended levels, find cause, repair, and adjust refrigerant charge to achieve optimal operating levels.	Annually
m Check integrity of all panels on equipment. Replace fasteners as needed to ensure proper integrity and fit/finish of equipment.	Annually
n Assess field serviceable bearings. Lubricate if necessary.	Annually
o Check drain pan, drain line, and coil for biological growth. Clean as needed.	Annually
p Check for evidence of buildup or fouling on heat exchange surfaces. Restore as needed to ensure proper operation.	Annually
q Inspect for evidence of moisture carryover beyond the drain pan from cooling coils. Make corrections or repairs as necessary.	Annually
r Check for proper damper operation. Clean, lubricate, repair, replace, or adjust as needed to ensure proper operation.	Annually
s Visually inspect areas of moisture accumulation for biological growth. If present, clean or disinfect as needed.	Annually
t Check condensate pump. Clean or replace as needed.	Annually
u Visually inspect exposed ductwork and external piping for insulation and vapor barrier for integrity. Correct as needed.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-3 Boilers

Inspection/Maintenance Task	Frequency*
a Visually inspect fuel filter. Clean, repair, or replace as needed to ensure proper operation.	Monthly
b Perform chemical testing of system water. Treat as needed to ensure proper water chemistry.	Monthly
c Check fuel pump for proper operation. Repair or replace as needed to ensure proper operation.	Quarterly
d Inspect blowdown or drain valve. Clear all debris to ensure proper operation. Repair or replace if needed.	Quarterly
e Check for evidence of leakage of fuel supply, heat transfer fluid, and flue gas. Repair as needed to ensure proper operation.	Quarterly
f Check control system and devices for evidence of improper operation. Clean, lubricate, repair, replace, or adjust components as needed to ensure proper operation.	Semiannually
g Check control box for dirt, debris, and/or loose terminations. Clean and tighten as needed.	Annually
h Check motor contactor for pitting or other signs of damage. Repair or replace as needed.	Annually
i Check for evidence of buildup or fouling, corrosion, or degradation on heat exchange surfaces. Restore as needed to ensure proper operation.	Annually
j Check for proper damper operation. Clean, lubricate, repair, replace, or adjust as needed to ensure proper operation.	Annually
k Check combustion chamber, burner, and flue for deterioration, moisture problems, condensation, and combustion products. Clean, test, and adjust combustion process for proper operation.	Annually
l Inspect refractory for damage or wear. Repair or replace as necessary to ensure proper operation. Clean upper and lower drums.	Annually
m Observe burner flame at high load for correct clearance from refractory.	Annually
n Verify proper operation of safety devices per manufacturer's recommendations. Repair or replace as needed.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-4 Chillers—Absorption

Inspection/Maintenance Task	Frequency*
a Check for the presence of noncondensibles. Take necessary steps to eliminate noncondensibles in system.	Weekly
b Perform chemical testing of system water. Treat as needed to ensure proper water chemistry.	Monthly (open systems) / Quarterly (closed systems)
c Check steam system traps, pumps, and controls. Clean or replace as needed to ensure proper operation.	Semiannually
d Check control system and devices for evidence of improper operation. Clean, lubricate, repair, adjust, or replace components as needed to ensure proper operation.	Semiannually
e Check variable-frequency drive for proper operation. Correct as needed.	Semiannually
f Check control box for dirt, debris, and/or loose terminations. Clean and tighten as needed.	Annually
g Check motor contactor for pitting or other signs of damage. Repair or replace as needed.	Annually
h Check for fouling, corrosion, or degradation. Clean or repair as needed.	Annually
i Check drive alignment, wear, seating, and operation. Repair or replace as needed.	Annually
j Check for evidence of buildup or fouling on heat exchange surfaces. Restore as needed to ensure proper operation.	Annually
k Check for proper fluid flow and for fluid leaks. Clean, adjust, and repair as needed to restore proper flow.	Annually
l Check inhibitor and internal fluid chemistry. Correct inhibitor and internal fluid chemistry if outside of established operating ranges.	Annually
m Verify proper operation of safety devices per manufacturer's recommendations. Repair or replace as needed.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-5 Chillers—Air-Cooled

Inspection/Maintenance Task	Frequency*
a Perform chemical testing of system water. Treat as needed to ensure proper water chemistry and freeze protection.	Quarterly
b Inspect gearbox for excessive wear. Repair or replace as needed.	Quarterly
c Check control system and devices for evidence of improper operation. Clean, lubricate, repair, adjust, or replace components as needed to ensure proper operation.	Semiannually
d Check fan belt tension. Check for belt wear and replace if necessary to ensure proper operation. Check sheaves for evidence of improper alignment or evidence of wear and correct as needed.	Semiannually
e Check variable-frequency drive for proper operation. Correct as needed.	Semiannually
f Check control box for dirt, debris, and/or loose terminations. Clean and tighten as needed.	Annually
g Check motor contactor for pitting or other signs of damage. Repair or replace as needed.	Annually
h Check fan blades and fan housing. Clean, repair, or replace as needed to ensure proper operation.	Annually
i Check refrigerant system pressures and/or temperatures. If outside of recommended levels, find cause, repair, and adjust refrigerant charge to achieve optimal operating levels.	Annually
j Check open drive alignment, wear, seating, and operation. Repair or replace as needed.	Annually
k Assess field-serviceable bearings. Lubricate if necessary.	Annually
l Check for evidence of buildup or fouling on heat exchange surfaces. Restore as needed to ensure proper operation.	Annually
m Check for proper fluid flow and for fluid leaks. Clean, adjust, and repair as needed to restore proper flow.	Annually
n Inspect air-cooled condenser surfaces for damage or evidence of leaks. Repair or clean as needed.	Annually
o Check low ambient head pressure control sequence for evidence of improper operation. Repair or replace components or modify software/algorithm to ensure proper operation.	Annually
p Check compressor oil level and/or pressure on refrigerant systems having oil level and/or pressure measurement means. Repair, replace, or adjust as needed to ensure proper control.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-6 Chillers—Water-Cooled

Inspection/Maintenance Task	Frequency*
a Perform chemical testing of system water. Treat as needed to ensure proper water chemistry and freeze protection.	Monthly (open systems) / Quarterly (closed systems)
b Inspect gearbox for excessive wear. Repair or replace as needed.	Quarterly
c Check control system and devices for evidence of improper operation. Clean, lubricate, repair, adjust, or replace components as needed to ensure proper operation.	Semiannually
d Check control box for dirt, debris, and/or loose terminations. Clean and tighten as needed.	Annually
e Check motor contactor for pitting or other signs of damage. Repair or replace as needed.	Annually
f Check refrigerant system pressures and/or temperatures. If outside of recommended levels, find cause, repair, and adjust refrigerant charge to achieve optimal operating levels.	Annually
g Check open drive alignment, wear, seating, and operation. Repair or replace as necessary.	Annually
h Check for evidence of buildup or fouling on heat exchange surfaces. Restore as needed to ensure proper operation.	Annually
i Check for proper fluid flow and for fluid leaks. Clean, adjust, and repair as needed to restore proper flow.	Annually
j Check compressor oil level and/or pressure on refrigerant systems having oil level and/or pressure measurement means. Repair, replace, or adjust as needed to ensure proper control.	Annually
k Check variable-frequency drive for proper operation. Correct as needed.	Annually
l Assess field-serviceable bearings. Lubricate if necessary.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-7 Coils and Radiators

Inspection/Maintenance Task	Frequency*
a Check ultraviolet lamp. Clean or replace as needed to ensure proper operation.	Quarterly
b Check for proper operation of control valves and vents. Correct as required.	Quarterly
c Check P-trap. Prime as needed to ensure proper operation.	Semiannually
d Check for proper fluid flow and for fluid leaks. Clean, adjust, and repair as needed to restore proper flow.	Semiannually
e Check control system and devices for evidence of improper operation. Clean, lubricate, repair, replace, or adjust as needed to ensure proper operation.	Semiannually
f Check refrigerant system temperatures. If outside of recommended levels, find cause, repair, and adjust refrigerant charge to achieve optimal operating levels.	Annually
g Check for evidence of buildup or fouling on heat exchange surfaces. Restore as needed to ensure proper operation.	Annually
h Check integrity of all panels on equipment. Replace fasteners as needed to ensure proper integrity and fit/finish of equipment.	Annually
i Check drain pan, drain line, coil, and other areas of moisture accumulation for biological growth. Clean or disinfect as needed.	Annually
j Check coil fins. Restore if possible. Replace coil if necessary to return to proper functioning.	Annually
k Inspect for evidence of moisture carryover beyond the drain pan from cooling coils. Make corrections or repairs to eliminate the condition.	Annually
l Check condensate pump. Clean or replace as needed.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-8 Condensing Units

Inspection/Maintenance Task	Frequency*
a Check control system and devices for evidence of improper operation. Clean, lubricate, repair, adjust, or replace components as needed to ensure proper operation.	Semiannually
b Check fan belt tension. Check for belt wear and replace if necessary to ensure proper operation. Check sheaves for evidence of improper alignment or evidence of wear and correct as needed.	Semiannually
c Check variable-frequency drive for proper operation. Correct as needed.	Semiannually
d Check control box for dirt, debris, and/or loose terminations. Clean and tighten as needed.	Annually
e Check motor contactor for pitting or other signs of damage. Repair or replace as needed.	Annually
f Check fan blades and fan housing. Clean, repair, or replace as needed to ensure proper operation.	Annually
g Check refrigerant system pressures or temperatures. If outside of recommended levels, find cause, repair, and adjust refrigerant to achieve optimal operating levels.	Annually
h Check for evidence of buildup or fouling on heat exchange surfaces. Restore as needed to ensure proper operation.	Annually
i Check open drive couplings, bearings, and seals for evidence of wear or alignment problems. Lubricate and repair or replace as needed.	Annually
j Inspect air-cooled condenser surfaces for damage or evidence of leaks. Repair or clean as needed.	Annually
k Check low ambient head pressure control sequence for evidence of improper operation. Repair or replace components or modify software/algorithm to ensure proper operation.	Annually
l Check refrigerant oil levels for refrigerant systems with oil pressure/level controls. Repair, replace, or adjust as needed to ensure proper operation.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-9 Control Systems

Inspection/Maintenance Task	Frequency*
a Check compressed-air system (e.g., compressor, dryer, receiver, blowdown valve) for proper operation. Check for evidence of oil carryover and condition of oil filter. Repair or replace as needed to ensure proper operation.	Monthly
b Check for proper air pressure. Repair or replace pneumatic system components as needed.	Monthly
c Measure relative humidity and repair, clean, or adjust system as necessary to ensure intended operation.	Quarterly
d Check control system devices for evidence of improper operation. Clean, lubricate, repair, adjust, or replace components as needed to ensure proper operation.	Semiannually
e Check time-of-day schedule to confirm consistency with facility operation. Adjust schedule as needed.	Semiannually
f Check control box for dirt, debris, and/or loose terminations. Clean and tighten as needed.	Annually
g Check motor contactor for pitting or other signs of damage. Repair or replace as needed.	Annually
h Check pneumatic lines for blockages. Clean as needed.	Annually
i Check to see that backup of digital control program is current.	Annually
j Check battery backup and verify proper operation.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-10 Cooling Towers and Evaporative-Cooled Devices

Inspection/Maintenance Task	Frequency*
a Perform chemical testing of system water. Treat as needed to ensure proper water chemistry. Adjust bleed or blowdown rate as required.	Monthly (open systems) / Quarterly (closed systems)
b Check water system ultraviolet lamp. Clean or replace as needed to ensure proper operation.	Quarterly
c Inspect blowdown or drain valve. Clear all debris to ensure proper operation. Repair or replace if needed.	Quarterly
d Check chemical injector device. Clean as needed.	Quarterly
e Check cooling tower fan open drive system couplings, bearings, and seals for wear and proper alignment. Adjust, lubricate, repair, or replace as needed.	Quarterly
f Check belt tension. Check for belt wear. Replace if necessary to ensure proper operation. Check sheaves for evidence of improper alignment. Correct as necessary to ensure proper operation.	Quarterly
g Check for fouling, corrosion, degradation, or dirt/debris accumulation on or in sump and strainer, wet decks, fill, nozzles, and exterior louvers. Clean or repair as needed.	Quarterly
h Check control system and devices for evidence of improper operation. Clean, lubricate, repair, adjust, or replace components as needed to ensure proper operation.	Semiannually
i Check variable-frequency drive for proper operation. Correct as needed.	Semiannually
j Visually inspect pumps and associated electrical components. Repair or replace as needed to ensure proper operation.	Semiannually
k Check control box for dirt, debris, and/or loose terminations. Clean and tighten as needed.	Annually
l Check fan blades and fan housing. Clean, repair, or replace as needed to ensure proper operation.	Annually
m Assess field-serviceable bearings. Lubricate if necessary.	Annually
n Check for proper fluid flow and for fluid leaks. Clean, adjust, and repair as needed to restore proper flow.	Annually
o Check for proper damper operation. Clean, lubricate, repair, replace, or adjust as needed to ensure proper operation.	Annually
p Check cooling tower motor(s) and pump(s) for proper operation. Repair or replace as needed to ensure proper operation.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-11 Dehumidification and Humidification Devices

Inspection/Maintenance Task	Frequency*
a Check ultraviolet lamp. Clean or replace as needed to ensure proper operation.	Quarterly
b Check for proper fluid flow and for fluid leaks. Clean, adjust, and repair as needed to restore proper flow.	Quarterly
c Measure relative humidity and adjust system controls as necessary.	Quarterly
d Check steam system traps, pumps, and controls. Clean or replace as needed to ensure proper operation.	Semiannually
e Check for fouling, corrosion, or degradation. Clean or repair as needed.	Annually
f Check strainers. Clean as needed.	Annually
g Visually inspect distributors, drain pans, and other areas of moisture accumulation for biological growth. Clean or disinfect as needed.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-12 Economizers—Air-Side

Inspection/Maintenance Task	Frequency*
a Check air filter and housing integrity. Correct as needed.	Monthly
b Check for particulate accumulation on filters. Clean or replace as necessary to ensure proper operation.	Monthly
c Check condition, setting, and operation of outdoor sensor, return air sensor, or change-over controller. Repair, adjust, or replace components to ensure proper operation.	Semiannually
d Check condition, setting, and operation of the economizer controller. Repair, adjust, or replace components to ensure proper operation.	Semiannually
e Check condition, setting, and operation of the mixed-air/discharge sensor or changeover controller. Repair, adjust, or replace components to ensure proper operation.	Semiannually
f Check dampers for proper condition, setting, and operation. Repair, adjust, lubricate, or replace components to ensure proper operation.	Semiannually
g Check condition, setting, and operation of the economizer damper motors. Repair, adjust, lubricate, or replace components to ensure proper operation.	Semiannually
h Check sealing integrity of all panels on equipment. Replace fasteners and gasketing as needed.	Semiannually
i Visually inspect areas of moisture accumulation for biological growth. If present, clean or disinfect as needed.	Semiannually
j Assess field-serviceable bearings, lubricate if necessary.	Annually
k Check condition, setting, and operation of the low-limit stat. Repair, adjust, or replace components to ensure proper operation.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-13 Engines, Microturbines

Inspection/Maintenance Task	Frequency*
a Check oil level and pressure. Add and adjust as needed to ensure proper operation.	Monthly
b Visually inspect fuel filter. Clean, repair, or replace as needed to ensure proper operation.	Monthly
c Check for particulate accumulation on turbine intake air filters. Clean or replace as necessary to ensure proper operation.	Monthly
d Inspect flex connections. Repair as needed.	Quarterly
e Check fuel pump for proper operation. Repair or replace as needed to ensure proper operation.	Quarterly
f Check control box for dirt, debris, and/or loose terminations. Clean and tighten as needed.	Annually
g Check motor contactor for pitting or other signs of damage. Repair or replace as needed.	Annually
h Check open drive couplings for evidence of wear or alignment problems. Repair or replace as necessary.	Annually
i Check exhaust system for corrosion. Repair or replace as needed.	Annually
j Verify proper operation of safety devices per manufacturer's recommendations. Repair or replace as needed.	Annually
k Assess field-serviceable bearings, lubricate if necessary.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-14 Fans (e.g., Exhaust, Supply, Transfer, Return)

Inspection/Maintenance Task	Frequency*
a Check fan belt tension. Check for belt wear and replace if necessary to ensure proper operation. Check sheaves for evidence of improper alignment or evidence of wear and correct as needed.	Semiannually
b Check fan drive for problems due to poor alignment or poor bearing seating. Repair or replace as needed.	Annually
c Check fan blades and fan housing. Clean, repair, or replace as needed to ensure proper operation.	Annually
d Assess field-serviceable bearings. Lubricate if necessary.	Annually
e Check variable-frequency drive for proper operation. Correct as needed.	Annually
f Check control box for dirt, debris, and/or loose terminations. Clean and tighten as needed.	Annually
g Check motor contactor for pitting or other signs of damage. Repair or replace as needed.	Annually
h Check integrity of all panels on equipment. Replace fasteners as needed to ensure proper integrity and fit/finish of equipment.	Annually
i Visually inspect exposed ductwork and external piping for insulation and vapor barrier integrity. Correct as needed.	Annually
j Check for proper damper operation. Clean, lubricate, repair, replace, or adjust as needed to ensure proper operation.	Annually
k Check control system and devices for evidence of improper operation. Clean, lubricate, repair, replace, or adjust as needed to ensure proper operation.	Annually
l Check integrity of flexible connections. Correct as needed.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-15 Fan-Coils, Hot Water, and Steam Unit Heaters

Inspection/Maintenance Task	Frequency*
a Check for particulate accumulation on filters. Clean or replace as necessary to ensure proper operation.	Quarterly
b Check ultraviolet lamp. Clean or replace as needed to ensure proper operation.	Quarterly
c Check steam system traps, pumps, and controls. Clean or replace as needed to ensure proper operation.	Semiannually
d Check control system and devices for evidence of improper operation. Clean, lubricate, repair, adjust, or replace components as needed to ensure proper operation.	Semiannually
e Check P-trap. Prime as needed to ensure proper operation.	Semiannually
f Check fan belt tension. Check for belt wear and replace if necessary to ensure proper operation. Check sheaves for evidence of improper alignment or evidence of wear and correct as needed.	Semiannually
g Check for proper operation of cooling or heating coil and for damage or evidence of leaks. Clean, restore, or replace as required.	Semiannually
h Check air filter fit and housing seal integrity. Correct as needed.	Annually
i Check control box for dirt, debris, and/or loose terminations. Clean and tighten as needed.	Annually
j Check fan blades and fan housing. Clean, repair, or replace as needed to ensure proper operation.	Annually
k Check refrigerant system temperatures. If outside of recommended levels, find cause, repair, and adjust refrigerant to achieve optimal operating levels.	Annually
l Check for evidence of buildup or fouling on heat exchange surfaces. Restore as needed to ensure proper operation.	Annually
m Check integrity of all panels on equipment. Replace fasteners as needed to ensure proper integrity and fit/finish of equipment.	Annually
n Assess field-serviceable bearings. Lubricate as necessary.	Annually
o Check for proper fluid flow. Clean, adjust, and repair as needed to restore proper flow.	
p Check drain pan, drain line, and coil for biological growth. Clean as needed.	Annually
q Check coil fins. Restore if possible. Replace coil if necessary to return to proper functioning.	Annually
r Inspect for evidence of moisture carryover beyond the drain pan from cooling coils. Make corrections or repairs as necessary.	Annually
s Check for proper damper operation. Clean, lubricate, repair, replace, or adjust as needed to ensure proper operation.	Annually
t Visually inspect areas of moisture accumulation for biological growth. If present, clean or disinfect as needed.	Annually
u Check condensate pump. Clean or replace.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-16 Furnaces, Combustion Unit Heaters

Inspection/Maintenance Task	Frequency*
a Visually inspect fuel filter. Clean, repair, or replace as needed to ensure proper operation.	Monthly
b Check for particulate accumulation on filters. Clean or replace as necessary to ensure proper operation.	Quarterly
c Check fuel pump for proper operation. Repair or replace as needed to ensure proper operation.	Semiannually
d Check control system and devices for evidence of improper operation. Clean, lubricate, repair, adjust, or replace components as needed to ensure proper operation.	Semiannually
e Check fan belt tension. Check for belt wear and replace if necessary to ensure proper operation. Check sheaves for evidence of improper alignment or evidence of wear and correct as needed.	Semiannually
f Check air filter fit and housing seal integrity. Correct as needed.	Annually
g Check control box for dirt, debris, and/or loose terminations. Clean and tighten as needed.	Annually
h Check fan blades and fan housing. Clean, repair, or replace as needed to ensure proper operation.	Annually
i Check fan drive for problems due to poor alignment or poor bearing seating. Repair or replace as needed.	Annually
j Check integrity of all panels on equipment. Replace fasteners as needed to ensure proper integrity and fit/finish of equipment.	Annually
k Assess field-serviceable bearings. Lubricate if necessary.	Annually
l Check for proper damper operation. Clean, lubricate, repair, replace, or adjust as needed to ensure proper operation.	Annually
m Check heat exchanger, combustion chamber, burner, and flue for deterioration, moisture problems, condensation, and combustion products. Clean, test, and adjust combustion process for proper operation.	Annually
n Verify proper operation of safety devices per manufacturer's recommendations. Repair or replace as needed.	Annually
o Check for proper operation of heating coil and for damage or evidence of leaks. Clean, restore, or replace as required.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-17 HVAC Water Distribution Systems

Inspection/Maintenance Task	Frequency*
a Perform chemical testing of system water. Treat as needed to ensure proper water chemistry.	Monthly (open systems) / Quarterly (closed systems)
b Check chemical injector device. Clean as needed.	Quarterly
c Check makeup water system for pressure and operation. Adjust as necessary.	Quarterly
d Vent air from system high points. Check for proper fluid flow and check piping for leaks. Repair as needed.	Quarterly
e Visually inspect pumps and associated electrical components. Repair or replace as needed to ensure proper operation.	Semiannually
f Check for evidence of buildup or fouling on heat exchange surfaces. Restore as needed to ensure proper operation.	Annually
g Check for proper fluid flow. Clean, adjust, and repair as needed to restore proper flow.	Annually
h Check strainers. Clean as needed.	Annually
i Visually inspect external piping insulation and vapor barrier for integrity. Correct as needed.	Annually
j Check freeze stats, relief valves, flow and float switches, low-water cutoffs, and other safety devices for proper operation and repair or replace as required.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-18 Indoor Section Duct-Free Splits

Inspection/Maintenance Task	Frequency*
a Check for particulate accumulation on filters. Clean or replace as necessary to ensure proper operation.	Quarterly
b Check control system and devices for evidence of improper operation. Clean, lubricate, repair, adjust, or replace components as needed to ensure proper operation.	Semiannually
c Check P-trap drain. Clean if necessary.	Semiannually
d Check air filter fit and housing seal integrity. Correct as needed.	Annually
e Check for proper operation of cooling or heating coil and for damage or evidence of leaks. Clean, restore, or replace as required.	Annually
f Check fan blades and fan housing. Clean, repair, or replace as needed to ensure proper operation.	Annually
g Check refrigerant system temperatures. If outside of recommended levels, find cause, repair, and adjust refrigerant charge to achieve optimal operating levels.	Annually
h Check integrity of all panels on equipment. Replace fasteners as needed to ensure proper integrity and fit/finish of equipment.	Annually
i Assess field-serviceable bearings. Lubricate if necessary.	Annually
j Check for proper fluid flow. Clean, adjust, and repair as needed to restore proper flow.	Annually
k Check drain pan, drain line, and coil for biological growth. Clean as needed.	Annually
l Check coil fins. Restore if possible. Replace coil if necessary to return to proper functioning.	Annually
m Visually inspect areas of moisture accumulation for biological growth. If present, clean or disinfect as needed.	Annually
n Check condensate pump. Clean or replace as necessary.	Annually
o Check variable-frequency drive for proper operation. Correct as needed.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-19 Outdoor Air Heat Exchanging Systems

Inspection/Maintenance Task	Frequency*
a Check air filter and housing integrity. Correct as needed.	Monthly
b Check for particulate accumulation on filters. Clean or replace as necessary to ensure proper operation.	Monthly
c Check control system devices for evidence of improper operation. Repair, adjust, or replace components to ensure proper operation.	Semiannually
d Check P-trap drain. Clean if necessary.	Semiannually
e Check fan belt tension. Check for belt wear and replace if necessary to ensure proper operation. Check sheaves for evidence of improper alignment or evidence of wear and correct as needed.	Semiannually
f Check for proper operation of heat exchanger. Clean, restore, repair, adjust, or replace components to ensure proper operation.	Semiannually
g Check for proper operation of enthalpy device. Clean, restore, repair, adjust, or replace components to ensure proper operation.	Semiannually
h Check control box for dirt, debris, and/or loose terminations. Clean and tighten as needed.	Semiannually
i Check for proper fluid flow and for fluid leaks. Clean, restore, or replace as required.	Semiannually
j Check drain pan, drain line, and heat exchanger for biological growth. Clean as needed.	Semiannually
k Check dampers for proper operation, condition, setting, and operation. Repair, adjust, lubricate, or replace components to ensure proper operation.	Semiannually
l Check condition, setting, and operation of damper motors. Repair, adjust, lubricate, or replace components to ensure proper operation.	Semiannually
m Check sealing integrity of all panels on equipment. Replace fasteners and gasketing as needed.	Semiannually
n Visually inspect areas of moisture accumulation for biological growth. If present, clean or disinfect as needed.	Semiannually
o Assess field serviceable bearings. Lubricate if necessary.	Annually
p Visually inspect exposed ductwork for insulation and vapor barrier integrity. Correct as needed.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-20 PTACs/PTHPs (Package Terminal Air Conditioners or Heat Pumps)

Inspection/Maintenance Task	Frequency*
a Check for particulate accumulation on filters. Clean or replace as necessary to ensure proper operation.	Quarterly
b Check control system and devices for evidence of improper operation. Clean, lubricate, repair, adjust, or replace components as needed to ensure proper operation.	Semiannually
c Check for proper fluid flow and for damage and evidence of leaks. Clean, adjust, and repair as needed to restore proper flow.	Semiannually
d Check air filter fit and housing seal integrity. Correct as needed.	Annually
e Check motor contactor for pitting or other signs of damage. Repair or replace as needed.	Annually
f Check fan blades and fan housing. Clean, repair, or replace as needed to ensure proper operation.	Annually
g Check refrigerant system temperatures. If outside of recommended levels, find cause, repair, and adjust refrigerant charge to achieve optimal operating levels.	Annually
h Check integrity of all panels on equipment. Replace fasteners as needed to ensure proper integrity and fit/finish of equipment.	Annually
i Check drain pan, drain line, and coil for biological growth and debris. Clean as needed.	Annually
j Check evaporator coil fins. Restore if possible. Replace coil if necessary to return to proper functioning.	Annually
k Inspect for evidence of moisture carryover beyond the drain pan from cooling coils. Make corrections or repairs as necessary.	Annually
l Inspect air-cooled condenser surfaces for damage or evidence of leaks. Repair or clean as needed.	Annually
m Visually inspect areas of moisture accumulation for biological growth. If present, clean or disinfect as needed.	Annually
n Assess field-serviceable bearings. Lubricate if necessary.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-21 Pumps

Inspection/Maintenance Task	Frequency*
a Check variable-frequency drive for proper operation. Correct as needed.	Semiannually
b Visually inspect pumps and associated electrical components. Repair or replace as needed to ensure proper operation.	Semiannually
c Check control system and devices for evidence of improper operation. Clean, lubricate, repair, adjust, or replace components as needed to ensure proper operation.	Annually
d Check motor contactor for pitting or other signs of damage. Repair or replace as needed.	Annually
e Check pump drive for wear or problems due to poor alignment or poor bearing seating. Repair or replace as needed.	Annually
f Check for proper fluid flow. Clean, adjust, and repair as needed to restore proper flow. Check pump, piping, and seals for fluid leaks. Repair as needed.	Annually
g Assess field-serviceable bearings. Lubricate if necessary.	Annually
h Check insulation, vibration isolators, and flexible connectors for integrity. Repair as needed.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-22 Rooftop Units

Inspection/Maintenance Task	Frequency*
a Check for particulate accumulation on filters. Clean or replace as necessary to ensure proper operation.	Quarterly
b Check ultraviolet lamp. Clean or replace as needed to ensure proper operation.	Quarterly
c Check steam system traps, pumps, and controls. Clean or replace as needed to ensure proper operation.	Semiannually
d Check control system and devices for evidence of improper operation. Clean, lubricate, repair, adjust, or replace components as needed to ensure proper operation.	Semiannually
e Check P-trap. Prime as needed to ensure proper operation.	Semiannually
f Check fan belt tension. Check for belt wear and replace if necessary to ensure proper operation. Check sheaves for evidence of improper alignment or evidence of wear and correct as needed.	Semiannually
g Check variable-frequency drive for proper operation. Correct as needed.	Semiannually
h Check for evidence of buildup or fouling on heat exchange surfaces. Restore as needed to ensure proper operation.	Semiannually
i Check for proper operation of cooling coil, heating coil, or heat exchangers and for damage or evidence of leaks. Clean, restore or replace as required.	Semiannually
j Check air filter fit and housing seal integrity. Correct as needed.	Annually
k Check control box for dirt, debris, and/or loose terminations. Clean and tighten as needed.	Annually
l Check motor contactor for pitting or other signs of damage. Repair or replace as needed.	Annually
m Check fan blades and fan housing. Clean, repair, or replace as needed to ensure proper operation.	Annually
n Check refrigerant system temperatures. If outside of recommended levels, find cause, repair, and adjust refrigerant charge to achieve optimal operating levels.	Annually
o Check fan drive for wear or problems due to poor alignment or poor bearing seating. Repair or replace as needed.	Annually
p Check integrity of all panels and curbs on equipment. Replace fasteners as needed to ensure proper integrity and fit/finish of equipment.	Annually
q Assess field-serviceable bearings. Lubricate if necessary.	Annually
r Check drain pan, drain line, and coil for biological growth. Clean as needed.	Annually
s Check evaporator coil fins. Restore if possible. Replace coil if necessary to return to proper functioning.	Annually
t Inspect for evidence of moisture carryover beyond the drain pan from cooling coils. Make corrections or repairs as necessary.	Annually
u Check for proper damper operation. Clean, lubricate, repair, replace, or adjust as needed to ensure proper operation.	Annually
v Inspect air-cooled condenser surfaces for damage or evidence of leaks. Repair or clean as needed.	Annually
w Check low ambient head pressure control sequence for proper operation. Repair or replace components or modify software/algorithm to ensure proper operation.	Annually
x Check combustion chamber, burner, and flue for deterioration, leaks, moisture problems, condensation, and combustion products. Clean, test, and adjust combustion process for proper operation.	Annually
y Visually inspect insulation and areas of moisture accumulation for biological growth. If present, clean or disinfect as needed.	Annually
z Check compressor oil levels and/or pressure on refrigerant systems having oil level and/or pressure measurement means. Repair, replace, or adjust as needed to ensure proper operation.	Annually
aa Visually inspect exposed ductwork and external piping for insulation and vapor barrier for integrity. Correct as needed.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-23 Steam Distribution Systems

Inspection/Maintenance Task	Frequency*
a Perform chemical testing of system condensate and feed water. Treat as needed to ensure proper water chemistry.	Quarterly
b Check piping for leaks. Repair as needed.	Quarterly
c Check safety devices per manufacturer's recommendations. Correct or replace as needed.	Quarterly
d Check piping anchors for integrity and check piping for alignment and expansion fittings for proper operation. Lubricate as needed.	Quarterly
e Inspect blowdown or drain valve. Clear all debris to ensure proper operation. Repair or replace if needed.	Quarterly
f Check chemical injector device. Clean as needed.	Quarterly
g Check steam system traps, pumps, and controls. Clean or replace as needed to ensure proper operation.	Semiannually
h Check for evidence of buildup or fouling on heat exchange surfaces. Restore as needed to ensure proper operation.	Annually
i Check for proper fluid flow. Clean, adjust, and repair as needed to restore proper flow.	Annually
j Check strainers. Clean as needed.	Annually
k Visually inspect external piping insulation and vapor barrier for integrity. Repair or replace as needed.	Annually
l Check interior of condensate return piping for wall thickness integrity. Repair or replace as needed.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-24 Terminal and Control Boxes (e.g., VAV, Fan-Powered, Bypass)

Inspection/Maintenance Task	Frequency*
a Check for particulate accumulation on filters. Clean or replace as necessary to ensure proper operation.	Quarterly
b Check control system and devices for evidence of improper operation. Clean, lubricate, repair, adjust, or replace components as needed to ensure proper operation.	Semiannually
c Check for proper operation of cooling or heating coil and for damage or evidence of leaks. Clean, restore, or replace as required.	Semiannually
d Check for proper fluid flow. Clean, adjust, and repair as needed to restore proper flow.	Semiannually
e Check air filter fit and housing seal integrity. Correct as needed.	Annually
f Check fan blades and fan housing. Clean, repair, or replace as needed to ensure proper operation.	Annually
g Check integrity of all panels on equipment. Replace fasteners as needed to ensure proper integrity and fit/finish of equipment.	Annually
h Check for proper damper operation. Clean, lubricate, repair, replace, or adjust as needed to ensure proper operation.	Annually
i Visually inspect areas of moisture accumulation for biological growth. If present, clean or disinfect as needed.	Annually
j Visually inspect exposed ductwork and external piping for insulation and vapor barrier for integrity. Correct as needed.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

TABLE 5-25 Water-Source Heat Pumps

Inspection/Maintenance Task	Frequency*
a Check for particulate accumulation on filters. Clean or replace as necessary to ensure proper operation.	Quarterly
b Check ultraviolet lamp. Clean or replace as needed to ensure proper operation.	Quarterly
c Check control system and devices for evidence of improper operation. Clean, lubricate, repair, adjust, or replace components as needed to ensure proper operation.	Semiannually
d Check P-trap. Prime as needed to ensure proper operation.	Semiannually
e Check for proper operation of cooling coil or heating coil and for damage or evidence of leaks. Clean, restore, or replace as needed.	Semiannually
f Check air filter fit and housing seal integrity. Correct as needed.	Annually
g Check fan blades and fan housing. Clean, repair, or replace as needed to ensure proper operation.	Annually
h Check integrity of all panels on equipment. Replace fasteners as needed to ensure proper integrity and fit/finish of equipment.	Annually
i Visually inspect areas of moisture accumulation for biological growth. If present, clean or disinfect as needed.	Annually
j Check drive alignment, wear, seating, and operation. Repair or replace as needed.	Annually
k Assess field-serviceable bearings. Lubricate if necessary.	Annually
l Check motor contactor for pitting or other signs of damage. Repair or replace as needed.	Annually
m Check refrigerant system temperatures. If outside of recommended levels, find cause, repair, and adjust refrigerant charge to achieve optimal operating levels.	Annually
n Check for evidence of buildup or fouling on heat exchange surfaces. Restore as needed to ensure proper operation.	Annually
o Check drain pan, drain line, and coil for biological growth. Clean as needed.	Annually
p Check coil fins. Restore if possible. Replace coil if necessary to return to proper functioning.	Annually
q Check for proper fluid flow. Clean, adjust, and repair as needed to restore proper flow.	Annually
r Inspect for evidence of moisture carryover beyond the drain pan from cooling coils. Make corrections or repairs as necessary.	Annually
s Check condensate pump. Clean or replace.	Annually

*Refer to Section 4.2.2.d for procedure to modify frequency.

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INFORMATIVE APPENDIX A— SOURCES OF PERFORMANCE OBJECTIVES

Following is a list of possible sources that may assist in the establishment of specific *performance objectives* based on *basis of design* and operational criteria specific to a particular system:

1. Design documents for the system with the provision that those documents still reflect the current loads, space utilization, and other system requirements
2. A duly licensed individual authorized to perform HVAC design work
3. Manufacturers' technical material or generally accepted industry criteria
4. Guidance from ASHRAE Standards 55, 62.1, and 90.1
5. Authority having jurisdiction
6. Licensed HVAC design professional
7. Contractor, professional engineer
8. Owner's Program Requirements

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INFORMATIVE APPENDIX B— IDENTIFYING INDICATORS OF UNACCEPTABLE CONDITIONS

When designing a maintenance plan, it is helpful to identify a number of representative observations or *inspections* of equipment conditions to serve as indicators of unacceptable operating conditions, *performance* degradation, or pending failure. The following list provides illustrative examples of such condition indicators.

Observation Related

1. Deformation, discoloration, contamination, or oxidation of component surfaces
2. Fluid or vapor leakage evidence
3. Excessive or abnormal noise or vibration
4. Loose or missing fasteners
5. Unusual ice, frost, or condensate formation

6. Worn or damaged electrical or thermal insulating materials
7. Unacceptably high levels of surface corrosion or scale accumulation
8. Unacceptable high accumulated dirt or sludge
9. Visible biological growth (fungi, algae, or bacteria)
10. Failure of an essential insulation system; condensation or physical damage present
11. Clogged or overflowing drains
12. Overheated electrical equipment
13. Obviously failed equipment
14. Abnormal building pressures

Performance Related

1. Filter operation outside established criterion such as pressure drop
2. Chiller incapable of producing leaving water temperature within original design
3. Airflow from any air handler is not within design requirements
4. Space temperature exceeds setpoint objectives
5. Condensing water temperature rises beyond design
6. Energy consumption deviates above the degree-day adjusted energy consumption without a significant change in operating hours or function

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**INFORMATIVE APPENDIX D—
ADDENDA DESCRIPTION INFORMATION**

ANSI/ASHRAE/ACCA Standard 180-2012 incorporates ANSI/ASHRAE/ACCA Standard 180-2008 and Addendum a to ANSI/ASHRAE/ACCA Standard 180-2008. Table D-1 describes the way in which the standard is affected by the change. It also lists the ASHRAE, ACCA, and ANSI approval dates for the addendum.

TABLE D-1 Addendum to ANSI/ASHRAE/ACCA Standard 180-2008

Addendum	Section(s) Affected	Description of Changes*	Approval Dates:
			• ACCA BOD • ASHRAE Standards Committee • ASHRAE BOD • ANSI
a	Section 5; Informative Appendix C	A thorough review of the standard under the continuous maintenance process has resulted in improvements, revisions, and updates to the tables in Section 5. The changes were deemed necessary in order to eliminate duplication, list equipment tables in alphabetical order for easier reference, and consolidate similar equipment where appropriate.	November 18, 2011 January 21, 2012 January 25, 2012 January 26, 2012

* These descriptions may not be complete and are provided for information only.

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the standards and guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive technical committee structure, continue to generate up-to-date standards and guidelines where appropriate and adopt, recommend, and promote those new and revised standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating standards and guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

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About ASHRAE

ASHRAE, founded in 1894, is an international organization of some 50,000 members. ASHRAE fulfills its mission of advancing heating, ventilation, air conditioning, and refrigeration to serve humanity and promote a sustainable world through research, standards writing, publishing, and continuing education.

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About ACCA

Air Conditioning Contractors of America (ACCA) is a nonprofit association serving more than 60,000 professionals and 4,000 businesses in the HVACR community. ACCA promotes professional contracting, energy efficiency, and healthy, comfortable indoor environments.

For more information or to become a member of ACCA, visit www.acca.org.

For a list of ACCA resources for contractors, including HVAC systems design manuals, visit www.acca.org/store or call 888-290-2220.

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