

STANDARD

**ANSI/ASHRAE/IES Addendum a to
ANSI/ASHRAE/IES Standard 100-2018**

Energy Efficiency in Existing Buildings

Approved by ASHRAE and the American National Standards Institute on February 26, 2021, and by the Illuminating Engineering Society on February 18, 2021.

This addendum was approved by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. Instructions for how to submit a change can be found on the ASHRAE® website (<https://www.ashrae.org/continuous-maintenance>).

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FOREWORD

Standard 100-2018 Section 6.3 sets out the overall requirement for the implementation of the operations and maintenance (O&M) program. A minor revision to this section clarifies that Normative Annex L focuses on the process and procedures for establishing and implementing the O&M program.

Standard 100-2018 Normative Annex L is based on ASHRAE/ACCA Standard 180-2012, Standard Practice for the Inspection and Maintenance of Commercial Building HVAC Systems, Section 4, "Implementation." This section in Standard 180 presents an excellent outline of what constitutes a good maintenance program that would be applicable to all building systems. SSPC 100 decided to adopt Standard 180, Section 4, as the requirement for its O&M program requirements. Where Standard 180 refers to "HVAC systems," Normative Annex L in Standard 100 refers to "all building systems." Other than these changes, Normative Annex L is identical to Section 180-2012 Section 4.

Since Standard 100-2018 was approved for publication, a revised edition of Standard 180 has been published. In the revised Standard 180-2018, Section 4, "Implementation," has been revised fairly extensively. Addendum a replaces the existing Normative Annex L in Standard 100-2018 with a new one based on Standard 180-2018 Section 4.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~striketrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes.

Addendum a to Standard 100-2018

Delete existing Normative Annex L and replace with the new version as shown.

(This is a normative annex and is part of this standard.)

NORMATIVE ANNEX L **OPERATIONS AND MAINTENANCE IMPLEMENTATION**

Informative Note: This annex is based on ANSI/ASHRAE/ACCA Standard 180-2018, Standard Practice for the Inspection and Maintenance of Commercial Building HVAC Systems, Section 4, "Implementation," with application to the operations and maintenance of all building systems.

L1. INTRODUCTION

This standard is intended to serve all segments of building ownership and all methods of delivering inspection and maintenance work. This standard applies to facilities with no maintenance program as well as facilities with state-of-the-art maintenance programs. Requirements are described in terms consistent with a minimum standard. Implementation methods chosen to achieve compliance with this standard are left to the responsible party and/or an authorized implementation partner. All parties may exceed these standard requirements as they see fit.

This standard is implemented by defining the party responsible for compliance and then defining a minimum maintenance program and the elements of the program. These program elements are described and defined to allow compliance to be achieved across the widest spectrum of owners and maintenance delivery systems as reasonably possible.

L2. 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.

L3. MAINTENANCE PROGRAM

There shall be a maintenance program that preserves the condition and capability of all building systems and equipment to enable each to provide the intended performance (e.g., thermal and visual comfort, energy efficiency, and indoor environmental quality) required for the facility. At a minimum, the maintenance program shall contain the elements in Sections L3.1 through L6.2.

L3.1 Inventory of Items to be Inspected and Maintained. All building systems and equipment that impact building envelope performance, thermal and visual comfort, energy efficiency, indoor environmental quality, and other services shall be listed in an equipment and component inventory of items to be inspected and maintained. This list shall include manufacturers' information, location, capacity, maintenance program identifier, and other data relevant to the equipment or component and agreed upon by the responsible party and implementing party.

L3.2 Maintenance Plan. A plan of inspection and maintenance work shall be established. The maintenance plan shall document the work to be accomplished at scheduled intervals on the inventory of work to be maintained. The maintenance plan shall be developed specifically for the size, design, scope, criticality, and complexity of the systems and equipment serving the facility. The plan shall describe each required task, the frequency of each task, and task schedule; identify the party responsible for performing the task; and specify the authorizing party, task completion documentation procedure, plan monitoring procedures, and procedures for evaluation and feedback. The plan shall include the information described in L3.2.1 through L3.2.4.

L3.2.1 Minimum Required Inspection and Maintenance Tasks. The minimum required inspection and maintenance tasks shall be determined from codes, regulations, and manufacturers' recommendations. In any of the foregoing, all of the tasks that apply to the equipment or components in the maintenance program shall be included in the list of required inspection and maintenance tasks to comply with this standard.

L3.2.2 Inspection and Maintenance Task Frequencies. The baseline frequencies of inspections and maintenance tasks for equipment and systems shall be determined from the sources listed in Section L3.2.1. These frequencies are the minimum required for compliance.

Refer to Section L5 for requirements for revising inspection and maintenance task frequencies.

Informative Note: Inspection serves to monitor and document the condition of equipment and components over time with regard to appearance, functionality, and performance. Maintenance serves to preserve equipment and component condition and performance as required by the facility.

L3.2.3 Condition Indicators. Condition indicators for systems and equipment shall be developed. These indicators are measurements or observations of physical condition and delivery of thermal and visual comfort, indoor environmental quality, and energy efficiency that are learned during the performance of the related inspection tasks and compared to the condition standard. The comparisons serve to determine the level of degradation and subsequent responsive action. The responsible party and the maintenance program implementer shall mutually agree on the condition indicators and standards used in the maintenance program.

Informative Note: The intent of this standard is to (a) monitor changes in the condition indicators over time as a measure of the efficacy of the maintenance program in meeting performance objectives and (b) provide advance indication of pending equipment or component failures. Unacceptable condition indicators could lead to equipment failure or performance degradation. When condition indicators reach unacceptable levels, additional preservative or restorative action is required.

L3.2.4 Maintenance Program Objectives. Program objectives shall be established to define desired outcomes for the maintenance program for all building systems and equipment that impact building envelope performance, and that deliver required thermal and visual comfort, energy efficiency, and indoor environmental quality, and other services. Program objectives shall be measurable quantities that can be trended over time, and shall, when achieved define maintenance program success. Program objectives shall be based on responsible party requirements and operating procedures. The responsible party and the implementing party shall mutually agree on the program objectives. The program objectives shall be documented. Status of program objectives shall be reviewed periodically.

Informative Note: The following sources may assist in establishing specific program objectives based on the basis of design and operational criteria specific to a particular system or component:

- a. Design documents for the building and its systems, with the provision that those documents still reflect the current loads, space utilization, and other system requirements
- b. A duly licensed professional authorized to perform design work for the relevant system or component
- c. Manufacturers' technical material or generally accepted industry criteria
- d. Guidance from ASHRAE Standards 55, 62.1, and 90.1
- e. Authorities having jurisdiction
- f. Licensed contractor with expertise in the relevant system or component
- g. Owner's program requirements

L4. MAINTENANCE PLAN AUTHORIZATION AND EXECUTION

The maintenance plan shall be approved by the responsible party with concurrence by the implementing party. Approval shall authorize performing the work included in the plan.

L4.1 Inspection and maintenance tasks shall be performed on the established frequency or upon documented observance of an unacceptable condition. Whether or not authorized by written or verbal instructions, execution of the task shall be documented and archived for future reference.

Informative Notes:

1. The maintenance plan should include provisions for responding to unplanned inspection and maintenance events.
2. Response to discovery of unacceptable conditions found between task intervals should require authorization to perform the required work with proper documentation. Good practice, once unacceptable conditions are found, is to take action to return equipment to its required condition or performance capability. The responsible party and the implementing party must agree on the resource requirements for the work.
3. Unplanned events where additional work beyond the scope of this standard is required, such as repair or replacement, may require additional approval, funding, or authorization action by the responsible party and the implementing party for the work to proceed.

L5. REVISION OF THE MAINTENANCE PROGRAM AND MAINTENANCE PLAN

The maintenance program shall be capable of continuous improvement. Improvement in this context shall be manifest when changes in equipment condition or status, changes to the facility, or acquisition of new maintenance technology warrant review and revision of the maintenance plan. The intent of the standard is to enable tasks and/or frequencies to be changed in order to deliver proper preservative action in response to actual conditions.

Informative Notes: The following list contains examples of changes to the facility, its components or operating systems, and equipment that require review of the maintenance plan:

1. Modifications to the *building* that impact system capacities or configuration
2. Changes to *building* function or *building* use that impact the design intent or configuration of components or systems
3. Changes to *building* systems or components
4. One or more systems found incapable of achieving their design intent or owner requirements
5. Documented, agreed upon recommendations from the responsible party or maintenance provider
6. Miscellaneous changes:
 - a. Changes to equipment condition
 - b. Changes to equipment status
 - c. Changes to the facility
 - d. Acquisition of new maintenance technology
 - e. Revision to task frequencies in response to actual conditions may result in improved condition or reduced inspection and maintenance work.

L5.1 Degradation of Condition and Performance. Degradation of equipment condition or performance that is observed while performing scheduled inspection and maintenance tasks or on other occasions shall be documented.

L5.2 Response to Changes. Upon initial discovery or observation of the degraded state, the situation shall be resolved through appropriate corrective or preservative action. If preservative action cannot resolve the degraded status, then further action outside the scope of this standard may be required.

L5.3 If unacceptable condition indicators or unacceptable performance are found on a system or component during two successive inspections, the maintenance plan and condition history of the system or component shall be reviewed to determine if the inspection frequency or the maintenance task frequency should be increased. Further, maintenance tasks should also be reviewed for improvement opportunities. Results of the review, and revisions to the maintenance plan, shall be documented and implemented.

L5.4 If acceptable condition indicators or acceptable performance are observed during three successive inspections, the maintenance plan shall be reviewed for opportunities to reduce task frequencies or work procedures without compromising condition or performance. Revisions to task frequencies and work procedures shall be documented.

L5.5 Climate-related or facility operational requirements may impact execution of the maintenance plan. These circumstances shall be reviewed along with the maintenance plan for opportunities to revise task frequencies or work procedures. Revisions to task frequencies and work procedures shall be documented.

Informative Note: Some of these circumstances may interrupt the delivery of inspection and maintenance care. These deferrals of the maintenance plan provide an opportunity to review existing inspection and maintenance tasks and frequencies and make appropriate adjustments considering the impact of the deferral. Each adjusted frequency should be documented and include the reason for the adjustment.

L5.6 Equipment Warranty. This standard's requirements shall not supersede equipment manufacturers' warranty terms and conditions and other guidance that may require different tasks or task frequencies.

L6. PROGRAM REVIEW

The responsible party and the implementing party shall periodically review the maintenance program. There shall be at least two formal review meetings between the responsible party and the implementing party, one at the beginning of the performance period and one at the end of the performance period.

L6.1 Beginning Review. The responsible party and the implementing party shall define scope, expectations, and desired outcomes for the maintenance program. Initial review shall consist of developing program objectives, condition standards, and measures to be used to evaluate program performance that are mutually acceptable to the responsible party and the implementing party. These factors shall be established before the work commences. Creating performance objectives and condition standards ahead of implementation, both authorizing party and implementing party align expectations based on knowledge of the goals and evaluation measures established for the program and maintenance plan.

L6.2 End Review. The end review shall consist of comparing maintenance program results with the program results and condition standards. The responsible party and the implementing party shall review the measurements and observations collected during the evaluation period. The actual results shall be compared to the program requirements, desired outcomes, and performance of building systems and components. The comparison shall serve to evaluate the maintenance program performance. The information shall be used to develop a plan for improving the maintenance program. Program improvement actions shall be mutually agreeable between the responsible party and the implementing party.

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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.

ASHRAE · 180 Technology Parkway NW · Peachtree Corners, GA 30092 · www.ashrae.org

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As an industry leader in research, standards writing, publishing, certification, and continuing education, ASHRAE and its members are dedicated to promoting a healthy and sustainable built environment for all, through strategic partnerships with organizations in the HVAC&R community and across related industries.

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