ASHRAE Addendum r to ASHRAE Guideline 36-2021

High-Performance Sequences of Operation for HVAC Systems

Approved by ASHRAE and the American National Standards Institute on February 29, 2024.

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 (www.ashrae.org/continuous-maintenance).

The latest edition of an ASHRAE Standard may be purchased on the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 180 Technology Parkway, Peachtree Corners, GA 30092. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

© 2024 ASHRAE                  ISSN 1041-2336
SPECIAL NOTE

This American National Standard (ANS) is a national voluntary consensus Standard developed under the auspices of ASHRAE. Consensus is defined by the American National Standards Institute (ANSI), of which ASHRAE is a member and which has approved this Standard as an ANS, as "substantial agreement reached by directly and materially affected interest categories. This signifies the concurrence of more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that an effort be made toward their resolution." Compliance with this Standard is voluntary until and unless a legal jurisdiction makes compliance mandatory through legislation.

ASHRAE obtains consensus through participation of its national and international members, associated societies, and public review.

ASHRAE Standards are prepared by a Project Committee appointed specifically for the purpose of writing the Standard. The Project Committee Chair and Vice-Chair must be members of ASHRAE; while other committee members may or may not be ASHRAE members, all must be technically qualified in the subject area of the Standard. Every effort is made to balance the concerned interests on all Project Committees.

The Senior Manager of Standards of ASHRAE should be contacted for:

a. interpretation of the contents of this Standard,
b. participation in the next review of the Standard,
c. offering constructive criticism for improving the Standard, or
d. permission to reprint portions of the Standard.

DISCLAIMER

ASHRAE uses its best efforts to promulgate Standards and Guidelines for the benefit of the public in light of available information and accepted industry practices. However, ASHRAE does not guarantee, certify, or assure the safety or performance of any products, components, or systems tested, installed, or operated in accordance with ASHRAE’s Standards or Guidelines or that any tests conducted under its Standards or Guidelines will be nonhazardous or free from risk.

ASHRAE INDUSTRIAL ADVERTISING POLICY ON STANDARDS

ASHRAE Standards and Guidelines are established to assist industry and the public by offering a uniform method of testing for rating purposes, by suggesting safe practices in designing and installing equipment, by providing proper definitions of this equipment, and by providing other information that may serve to guide the industry. The creation of ASHRAE Standards and Guidelines is determined by the need for them, and conformance to them is completely voluntary.

In referring to this Standard or Guideline and in marking of equipment and in advertising, no claim shall be made, either stated or implied, that the product has been approved by ASHRAE.
(This foreword is not part of this guideline. It is merely informative and does not contain requirements necessary for conformance to the guideline.)

FOREWORD
This addendum prevents a potential issue where the condenser water supply temperature setpoint could get “stuck” if load were to suddenly increase, making it impossible for CWST to achieve setpoint + 0.5°F for hours on end. The logic would only get “unstuck” when load (or ambient wet bulb) decreased enough for CWST to drop to within 0.5°F of setpoint.

In practice, this shouldn’t be an issue because the guideline includes informative text that states that this sequence should only be used in cases where loads are slow-changing. This addendum improves fault tolerance by incrementally resetting CWST upwards if the towers are unable to make setpoint.

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

Addendum r to Guideline 36-2021
(IP and SI Units)

Revise Section 5.20.12.2.b.6 as follows:

6. At the end of every time interval, equal in length to the Chilled Water Plant Reset time step (see Section 5.20.5.2.a) plus 5 minutes, execute the following reset:

   i. After the initial time interval, reset CWSTsp down 1°F.

   There is no history when the plant is first enabled, so a direction to reset must be picked arbitrarily.

   ii. For each subsequent time interval,

      (a) Reset CWSTsp up by 1°F if CWST is more than 0.5°F above present setpoint and tower fan speed is greater than 99%.

      (b) For each subsequent time interval Else, reset CWSTsp down by 1°F if CWST is no more than 0.5°F above present setpoint, tower fan speed command is less than 95%, CHWST setpoint has not increased relative to the setpoint at the end of the previous interval, and either:

          (1) CWSTsp had reset down in the previous time interval and EffCh+T is now less than at the previous setpoint change.

          (2) CWSTsp had reset up in the previous time interval and EffCh+T is now greater than at the previous setpoint change.

      (c) Else, if CWST is no more than 0.5°F below present setpoint, reset CWSTsp up by 1°F.

      (d) Else, do not change CWSTsp.
This logic attempts to optimize total chiller and tower efficiency. Since CW pump speed is fixed except when modulated for head pressure control (as applicable), CW pump power is not included in the optimization logic.

Two varying parameters can cofound this stepwise efficiency optimization routine: (1) varying plant load and (2) chilled water supply temperature setpoint reset. Both factors independently impact chiller efficiency and tower efficiency, making attribution of increases and decreases in efficiency to CWST setpoint reset alone impossible. As such, this approach is not recommended for plants with dynamic load profiles. Additionally, note that CWST setpoint is not allowed to reset down concurrently with CHWST setpoint resetting up since the latter typically outweighs the impact of the former making it impossible to tell whether the CWST reset did any good. A similar restriction is not placed on the CWST reset when CHWST setpoint is resetting down since chiller efficiency should continuously get worse in such a scenario, meaning the CWST setpoint will be self-correcting by repeatedly alternating setpoints within a 1°F range as efficiency continues to worsen until CHWST setpoint stabilizes.
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.
About ASHRAE

Founded in 1894, ASHRAE is a global professional society committed to serve humanity by advancing the arts and sciences of heating, ventilation, air conditioning, refrigeration, and their allied fields.

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.

To stay current with this and other ASHRAE Standards and Guidelines, visit www.ashrae.org/standards, and connect on LinkedIn, Facebook, Twitter, and YouTube.

Visit the ASHRAE Bookstore

ASHRAE offers its Standards and Guidelines in print, as immediately downloadable PDFs, and via ASHRAE Digital Collections, which provides online access with automatic updates as well as historical versions of publications. Selected Standards and Guidelines are also offered in redline versions that indicate the changes made between the active Standard or Guideline and its previous version. For more information, visit the Standards and Guidelines section of the ASHRAE Bookstore at www.ashrae.org/bookstore.

IMPORTANT NOTICES ABOUT THIS STANDARD

To ensure that you have all of the approved addenda, errata, and interpretations for this Standard, visit www.ashrae.org/standards to download them free of charge.

Addenda, errata, and interpretations for ASHRAE Standards and Guidelines are no longer distributed with copies of the Standards and Guidelines. ASHRAE provides these addenda, errata, and interpretations only in electronic form to promote more sustainable use of resources.