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SPECIAL NOTE

This American National Standard (ANS) is a national voluntary consensus standard developed under the auspices of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (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 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.

CONTENTS

ANSI/ASHRAE Standard 55-2010
Thermal Environmental Conditions for Human Occupancy

NOTE

Approved addenda, errata, or interpretations for this standard can be downloaded free of charge from the ASHRAE Web site at www.ashrae.org/technology.

(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.)

FOREWORD

ANSI/ASHRAE Standard 55-2010 is the latest edition of Standard 55. The 2010 edition combines Standard 55-2004 and the ten approved and published addenda to the 2004 edition into one easy-to-use, consolidated standard. The standard outlines conditions in which a specified fraction of the occupants will find the environment thermally acceptable. The standard is intended for use in design, commissioning, and testing of buildings and other occupied spaces and their HVAC systems and for the evaluation of thermal environments. Because it is not possible to prescribe the metabolic rate of occupants, and because of variations in occupant clothing levels, operating setpoints for buildings cannot practically be mandated by this standard.

Standard 55 was first published in 1966 and republished in 1974, 1981, and 1992. Beginning in 2004, it is now updated on a regular basis using ASHRAE's continuous maintenance procedures. According to these procedures, Standard 55 is continuously revised by addenda that are publicly reviewed, approved by ASHRAE and ANSI, and published and posted for free on the ASHRAE Web site.

As with previous updated editions of the standard, the 2004 edition introduced significant changes. Perhaps most notable were (1) the adoption of the computer model method for general indoor application, which brought the standard into close agreement with ISO Standards 7726[1] and 7730[2], and (2) the introduction of the Adaptive Method, which relied on recent research to support natural ventilation designs for more sustainable, energy efficient, and occupant-friendly designs.

Continuing in this spirit of introducing recent research innovations into the standard, several significant improvements have been made in the years since 2004. In particular, the use of elevated air speeds to widen the acceptable range of thermal conditions has been introduced and refined.

The standard previously allowed modest increases in operative temperature beyond the PMV-PPD ("Computer Model Method" in the standard) limits as a function of air speed and turbulence intensity. But field studies, including recently published work, show that occupants, especially when neutral or slightly warm, prefer higher air speeds than were previously allowed. In certain combinations of temperature ranges and personal factors, the preference for more air movement is greater than for less air movement. Addenda since 2004 included a new method for expressing and selecting air-speed limits, and alternatives for determining the boundaries of comfort at air speeds above 0.15 m/s (30 fpm). With these changes, the standard continues to focus on defining the range of indoor thermal environmental conditions acceptable to a majority of occupants, but accommodates an ever increasing variety of design solutions intended both to provide comfort and to respect today's imperative for sustainable buildings.

The 2010 edition of the standard includes the following significant changes:

- *Clarifies that the upper humidity limit shown on the psychrometric chart in the Graphic Comfort Zone Method applies to only that method. Higher humidity limits are allowed if evaluated with the Computer Model Method and no limits are imposed on the Adaptive Model.*
- *Revises requirements and calculation methods when increased air movement is used to maintain comfort in warm conditions. Standard Effective Temperature (SET) is reintroduced into the Standard as the calculation basis for determining the cooling effect of air movement. In general, the calculation method has been simplified with the removal of turbulence intensity and draft risk calculations, and the personal control limitations have been relaxed based on the results of new research. This change is expected to give clear requirements for application of ceiling fans for comfort cooling.*
- *Significant revisions to Section 6, "Compliance" that now clearly state the mandatory minimum requirements for analysis and documentation of a design to show that it meets the requirements in the standard. Informative appendix H expands on Section 6 by providing a compliance form for documentation of design compliance.*
- *A new general satisfaction survey has been added to section 7.5.2.1 as a method to evaluate thermal comfort in occupied spaces. The previous survey in the 2004 version of the standard was meant for evaluating comfort at a point in time (e.g., "how do you feel right now?"), and the new survey is meant to evaluate the overall comfort of a space (e.g., "how do you feel in general?"). Addition of a general satisfaction survey aligns standard 55 with current practice for survey-based post occupancy evaluations (POEs).*
- *Editorial changes have been made throughout to clarify the requirements in the standard. Wherever possible, the use of informative language in the standard is avoided.*

For more specific information on the changes and on other revisions made to the standard by addenda, refer to Informative Appendix I at the end of this standard. Users of the standard are encouraged to use the continuous maintenance procedure to suggest changes for further improvements. A form for submitting change proposals is included in the back of this edition. The project committee for Standard 55 will take formal action on all change proposals received.

1. PURPOSE

The purpose of this standard is to specify the combinations of indoor thermal environmental factors and personal factors that will produce thermal environmental conditions acceptable to a majority of the occupants within the space.

2. SCOPE

2.1 The environmental factors addressed in this standard are temperature, thermal radiation, humidity, and air speed; the personal factors are those of activity and clothing.