STANDARD

ANSI/ASHRAE Standard 161-2013
(Supersedes ANSI/ASHRAE Standard 161-2007)

Air Quality within Commercial Aircraft

See Appendix B for approval dates.

This standard is under continuous maintenance 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. The change submittal form, instructions, and deadlines may be obtained in electronic form from the ASHRAE website (www.ashrae.org) or in paper form from the Manager of Standards. The latest edition of an ASHRAE Standard may be purchased from the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: orders@ashrae.org. Fax: 404-321-5478. 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.

 ISSN 1041-2336

Approved American National Standard
ANSI
www.ansi.org

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 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 161-2013, Air Quality within Commercial Aircraft

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. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

FOREWORD

The environment aboard commercial aircraft is different than that found in other spaces commonly occupied by people. Occupant density is typically high, and occupant activity levels range from almost completely sedentary (passengers) to very active (flight attendants). Aircraft passengers and crew make up a wide cross section of the general population, ranging from the very young to the very old, from the healthy to the infirm, and from frequent fliers to inexperienced fliers. In addition, the aircraft must be regarded as both a public place (passengers) and a workplace (crew). A unique aspect of the aircraft environment is that, unlike many other indoor environments, including those for some other modes of transportation, occupants do not have the ability to remove themselves from the environment. The controlled atmosphere aboard the aircraft in flight is at a lower pressure and relative humidity than that found in many other environments. Further, unlike other indoor environments, the outside air intended for ventilation is first compressed and heated in the aircraft engines/APU, creating the potential for engine-sourced and entrained compounds to contaminate the cabin air. The environment outside the aircraft in flight is hostile to human life and, while aircraft are operated with the comfort of passengers and crew in mind, their safety and health must always be paramount.

This standard addresses these unique characteristics of aircraft cabin environments as well as characteristics that are common to many other indoor environments. The scope of this standard references 14CFR25 to define the category of aircraft to which the standard applies. It is not intended to exclude aircraft of the same category certified in other jurisdictions. The term "commercial aircraft" as used in this standard refers to aircraft engaged in common carriage as defined in the Airworthiness Handbook, *Order 8300.10, Volume 2, Chapter 60, Section 5 (U.S. Federal Aviation Administration, Department of Transportation, U.S. Government Printing Office, Washington, DC, October 2006).*

Standard 161 is updated using ASHRAE's continuous maintenance procedures. According to these procedures, the standard is continuously revised by addenda that are publicly reviewed, approved by ASHRAE and ANSI, and published and posted for free on the ASHRAE website. Instructions and forms for submitting a proposed change can be found at the end of the standard.

1. PURPOSE

This standard defines the requirements for air quality in air-carrier aircraft and specifies methods for measurement and testing in order to establish compliance with the standard.

2. SCOPE

2.1 This standard applies to commercial passenger air-carrier aircraft carrying 20 or more passengers and certified under Title 14 CFR Part 25.[1]

2.2 This standard considers chemical, physical, and biological contaminants as well as moisture, temperature, pressure, and other factors that may affect air quality.

2.3 Because this standard cannot take into account every variable, especially those relating to safe operation of the aircraft, the diversity of sources and types of contaminants in aircraft cabin air, and the range of susceptibility in the population, compliance with this standard will not necessarily ensure acceptable aircraft cabin air quality for everyone.

3. DEFINITIONS

air, ambient: the outside air surrounding the aircraft.

air, engine bleed: air extracted from the compressor stages of gas turbine propulsion engines and auxiliary power units.

air, outside: as used in this standard, this term always refers to ambient air supplied to the aircraft cabin by the environmental control system.

air, recirculated: air from the aircraft passenger cabin that is reused as part of the supply air.

air, supply: air delivered to the aircraft cabin and used for pressurization, ventilation, temperature control, and humidity control.

air-conditioning system (packs): a part of the environmental control system, typically pneumatically powered, that provides cooling and heating for aircraft cabin temperature control.

aircraft, commercial: an aircraft engaged in common carriage according to FAA 8300:10.[2]

auxiliary power unit (APU): a gas-turbine powered unit that provides electrical power and compressed air to operate aircraft systems independent of the aircraft propulsion engines.

cabin: a term applied to any spaces in the aircraft occupied by passengers or crew members.

cabin altitude: the effective altitude to which the aircraft cabin is pressurized.

cabin pressure control system (CPCS): part of the environmental control system that regulates cabin altitude.

contaminant: an airborne constituent that may reduce acceptability of the air.

cockpit: see *flight deck.*

environmental control system (ECS): the equipment in an aircraft used to pressurize, ventilate, air condition, dehumidify, or humidify the aircraft cabin. It includes cabin-supply airflow control, temperature control, distribution, recirculation, and filtration.

flight: a term used in this standard to describe the status of the aircraft anytime it is not in contact with the ground. **Note:** This definition is not necessarily consistent with the FAA definition of flight operations.