



AEROSPACE STANDARD

AS5671™

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Design and Performance Criteria: Interior Passenger Stairways on Transport Category Airplanes

RATIONALE

This SAE Aerospace Standard gives design specifications for onboard stairways.

1. SCOPE

- 1.1 This SAE Aerospace Standard (AS) provides design criteria for onboard stairways intended for use by passengers aboard multi-deck transport category airplanes. It is not intended for stairways designed for use only by crewmembers, supernumeraries, or maintenance personnel. Additionally, this AS does not apply to fuselage mounted or external stairways used for boarding passengers, which are covered by ARP836.
- 1.2 The purpose of this AS is to assist airplane manufacturers in designing stairways on which users will be less likely to experience a misstep or fall during normal operations and on which movement during an emergency evacuation will be as efficient as is possible.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AIR512	Aircraft Cabin Illumination
ARP836	Design and Safety Criteria for Passenger Boarding Stairways
AIR5670	Issues in Stairway Design Aboard Transport Category Airplanes

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2.1.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM F1166 Standard Practice for Human Engineering Design for Marine Systems, Equipment, and Facilities

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Aerospace Technical Report.

- 2.2.1 Illuminating Engineering Society of North America. *Lighting Handbook*, New York: IESNA. (212) 248-5000.
- 2.2.2 International Building Code. International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001, (202) 370-1800.
- 2.2.3 Johnson, D. A. (1998, October). New Stairway ... Old Problems. *Ergonomics in Design*. Santa Monica, CA: Human Factors and Ergonomics Society.
- 2.2.4 Johnson, D. A. (2005, Spring). Error in stair measurement. *Ergonomics in Design*. Santa Monica, CA: Human Factors and Ergonomics Society. Reprinted in *By Design, 2005. Summer 5(1)*. Des Plaines, Illinois: American Society of Safety Engineers.
- 2.2.5 Johnson, D. A. (2006). *An improved method for measuring stairways*. International Ergonomics Association, Maastricht, The Netherlands. www.dajinc1@mac.com.
- 2.2.6 Johnson, D. A. (2009) Improper construction results in dangerous stairs: Large top runs produce fall hazard. *Proceedings of the 53rd Annual Meeting of the Human Factors and Ergonomics Society*. Santa Monica, CA: Human Factors and Ergonomics Society.
- 2.2.7 Johnson, D. A. and Pauls, J. (2010). Systemic stair step geometry defects, increased injuries, and public health plus regulatory responses. In Anderson, M. (Ed.) *Contemporary Ergonomics and Human Factors*. Boca Raton, FL: CRC Press.
- 2.2.8 Johnson, D. A. (2012). Stair safety: Bottom of flight illusion. *Work: A Journal of Prevention, Assessment and Rehabilitation*, (41) Supplement 1/2012, 3358-3362.
- 2.2.9 Johnson, D. A. & Sloan, G. D. (2012). Measuring step geometry using the Nose-to-Nose method: Validity and repeatability. *Work: A Journal of Prevention, Assessment and Rehabilitation*, (41) Supplement 1/2012, 3343-3348.
- 2.2.10 Life Safety Code Handbook. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA, USA, 02169-7471, (617) 770-3000.
- 2.2.11 Maki, B. E., Bartlett, S. A., and Fernie, G. R. (1984). Influence of stairway handrail height on the ability to generate stabilizing forces and moments. *Human Factors*, 26(6), 705-714.
- 2.2.12 Maki, B. E., Bartlett, S. A., and Fernie, G. R. (1985). Effect of stairway pitch on optimal handrail height. *Human Factors*, 27(3), 355-359.
- 2.2.13 Maki, B. E. (1985). Influence of handrail shape, size and surface texture on the ability of young and elderly users to generate stabilizing forces and moments (Contract No. OSR84-00197). Ontario, Canada: National Research Council.
- 2.2.14 Maki, B. E., Perry, S. D., and McIlroy, W. E. (1998). Efficacy of handrails in preventing stairway falls: A new experimental approach. *Safety Science*, 28(3), 189-206.

- 2.2.15 Pauls, J. L. and Harbuck, S. C. (2008). Ergonomics-based Methods of Inspecting, Assessing and Documenting Environmental Sites of Injurious Falls. Presented at American Society of Safety Engineers.
- 2.2.16 Roys, M. S. (2000). Serious stair injuries can be prevented by improved stair design. *Applied Ergonomics*, 32, 135-139.
- 2.2.17 Roys, M. and Wright, M. (2003.) *Proprietary nosing for non-domestic stairs*. Information paper 15/03, BRE Centre for Human Interaction, Garston, Watford UK WD25 9XX. Website: www.bre.co.uk.
- 2.2.18 Templer, J. (1992). The staircase: studies of hazards, falls and safer design. Cambridge, MA: MIT Press.
- 2.2.19 Wright, M. and Roys, M. (2005). Effect of changing stair dimensions on safety. *Contemporary Ergonomics 2005*. New York: Taylor & Francis. 469-474.
- 2.2.20 Wright, M. and Roys, M. (2008). Accidents on English dwelling stairs are directly related to going size. In Bust, P.D. (ed.) *Contemporary Ergonomics 2008*. New York: Taylor & Francis. 632-637.

2.3 Definitions

BALUSTER: The usually vertical supports of a handrail.

DIMENSIONAL UNIFORMITY: The condition that exists when the variability in tread or riser dimensions is within specified limits.

GOING: See RUN.

GUARD: A protective barrier erected along exposed edges of stairways to prevent inadvertent falls to a lower surface.

HANDRAIL: A rail that provides a handhold for maintaining stability when standing or moving. A handrail also provides visual and tactual guidance when using stairways.

LANDING: A nominally level walking surface at the top and bottom of a stair flight or ramp.

LANDING LENGTH: The dimension of the landing in the direction of travel, measured horizontally from the closest nosing.

LANDING WIDTH: The dimension of the landing perpendicular to the direction of travel.

LEVEL SURFACE: A walking surface that is not sloped more than 1:50 (1.1 degrees) relative to adjacent walking surfaces.

LUMINAIRE: A complete lighting system, consisting of the lamps, positioners, protectors, and any required connections to a power supply.

LUMINANCE: The light reflected from a surface.

NEWEL POST: A post at the head or foot of a flight of stairs supporting a handrail.

NOSING: The leading edge of the tread.

NOSING PROJECTION: The distance that the nosing extends beyond the intersection of the tread with the riser.

OVERHEAD CLEARANCE: The distance measured vertically between an overhead structure and a line connecting any two adjacent nosings.

RAMP: A walkway having an incline greater than 1:20 (2.9 degrees) relative to adjacent walking surfaces. Ramp design requirements are not addressed in this document.

RISE: The vertical distance between nosings of adjacent steps or, in the case of the bottom tread, the distance between the bottom nosing and the adjoining landing.