

ANSI Z535.1-2006 (R2011)

American National Standard for Safety Colors



ANSI Z535.1-2006 (R2011)



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Reaffirmation of
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American National Standard

Safety Colors

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Foreword

In 1979, the ANSI Z53 Committee on Safety Colors was combined with the ANSI Z35 Committee on Safety Signs to form the ANSI Z535 Committee on Safety Signs and Colors. The Z535 Committee has the following scope:

To develop standards for the design, application, and use of signs, colors, and symbols intended to identify and warn against specific hazards and for other accident prevention purposes.

While the basic mission and fundamental purpose of the ANSI Z535 Committee is to develop, refine, and promote a single, uniform graphic system used for communicating safety and accident prevention information, the Z535 Committee recognizes that this information can also be effectively communicated using other graphic systems.

The Z535 Committee created subcommittees to update the Z53 and Z35 standards and to write new standards. To date, the following six standards comprise the ANSI Z535 series:

- ANSI Z535.1 *Safety Colors* [ANSI Z53.1-1979 was updated and combined into this standard in 1991]
- ANSI Z535.2 *Environmental and Facility Safety Signs* [ANSI Z35.1-1972 and Z35.4-1972 were updated and combined into this standard in 1991]
- ANSI Z535.3 *Criteria for Safety Symbols* [new in 1991]
- ANSI Z535.4 *Product Safety Signs and Labels* [new in 1991]
- ANSI Z535.5 *Safety Tags and Barricade Tapes (for Temporary Hazards)* [ANSI Z35.2-1974 was updated and combined into this standard in 1991]
- ANSI Z535.6 *Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials* [new in 2006]

Together, these six standards contain the information needed to specify formats, colors, and symbols for safety signs used in environmental and facility applications, product and product literature applications, and temporary safety tag and barricade tape applications.

Published separately is the ANSI Z535 Safety Color Chart. This chart gives the user a sample of each of the safety colors red, orange, yellow, green, blue, purple, brown, grey, white, and black. It also describes each color's ink formulation and closest PANTONE® color.

This ANSI Z535.1 standard was prepared by the Z535.1 Subcommittee on Safety Colors. The foreword and all annexes are considered to be informative; the body is considered normative. In the vocabulary of writing standards, the word "informative" is meant to convey that the content presented is for informational purposes only and is not considered to be mandatory in nature. The word "normative" is meant to convey that the content is considered to be mandatory or prescriptive.

The 2011 edition of this standard is the eighth revision of the American War Standard, developed at the request of the War Department and approved by the American Standards Association (ASA) on July 16, 1945. The ASA was reconstituted as the USA Standards Institute (USASI) in August 1966, and as the American National Standards Institute (ANSI) in October 1969. Peacetime work on revising the American War Standard containing the Safety Color Code began in 1946 under committee procedures of the ASA, with the National Safety Council serving as sponsor of the project. The Sectional Committee on the Safety Color Code, Z53, reviewed the War Standard and enlarged its application to include the colors orange, blue, and purple. The committee also approved standard definitions and limits for the colors. The revised standard was approved by the ASA on September 11, 1953. In the 1971 revision, the Z53 committee deleted the color blue and modified the application of the color yellow, due to conflicts with other American National Standards.

In the fourth revision, a significant step forward was made toward increased safety through uniformity in safety color coding. The safety colors formerly used in this standard were combined and adjusted to give the best feasible discrimination for observers with either normal or color-deficient (colorblind) vision. For

the first time, safety color tolerance charts were available for use with this standard (see Section 8, Reference 17). Each color tolerance chart shows the standard color and six color tolerances illustrating acceptable ranges in hue, value (lightness), and chroma (saturation). Each color tolerance chart also lists the Munsell notation and equivalent CIE specifications (x, y, Y) for each standard color and tolerance sample. The colors brown, blue, and gray were added, and Table 1 was expanded to include the same information on most of the levels of the Universal Color Language (UCL) for the tolerance samples as for the standard or central sample of each Safety Color. Sections 1 to 6 of the present standard contain material similar to the fourth revision (Z53.1, 1979).

The intent of the fifth revision (1991) of the safety color standard was to provide a series of visually distinguishable safety colors, each with specific uses. The sixth revision in 1998 incorporated corrections and additions that helped to clarify the use of the standard in conjunction with the other Z535 standards. Annex A was also added at this time to explain how to relate the CIE safety color specifications contained in Table 1 with the CIE chromaticity diagrams illustrated in Figures 1, 2, and 3.

The seventh revision of the ANSI Z535.1 Safety Color Code, in 2002, had two major changes. The first is the deletion of information concerning the application of the safety colors. The intention in making this change was to maintain Z535.1 as the standard that defines the safety colors in terms of their color tolerances. The *application* of the colors (i.e., how they are to be used) properly belongs to the other standards in the ANSI Z535 series as well as to other standards that include use for safety colors. The second change was to include the “closest PANTONE® color” number for all of the safety colors on the Safety Color Chart that did not have a PANTONE® color reference. This was a practical addition that makes it easier for those needing to specify a safety color using the PANTONE® color matching system.

It is important to note that the color-rendering characteristics of several types of modern, high-efficiency light sources differ markedly from those of the average daylight source (CIE Source C) specified in Table 1. It is therefore essential that candidate safety colors be examined under the actual light sources to be used in order to ensure that they can be suitably differentiated and individually identified with their assigned color names.

The limited color gamut and aging characteristics of fluorescent colorants combine to restrict the number and chromaticities of fluorescent safety colors. For this reason, categories of unrestricted red-orange and unrestricted yellow fluorescent colors were added in 1998 to supplement the restricted specifications that are equivalent to CIE international standards. The unrestricted specifications may be used when no more than three distinguishable fluorescent safety colors are required for outdoor use for up to two years.

Recent research is providing conclusive evidence that highly chromatic colors, in some chromaticities, serve to increase or decrease the perception of lightness (for reflective materials) and brightness (for self-luminous objects). The effect is more dramatic in the case of colored lights and colored retroreflective materials. Future revisions of this standard might consider opportunities for improving the visibility of safety signs, colors, and symbols through the selective use of vividly colored retroreflectors as well as include test methods and color specifications for retroreflective and self-luminous materials.

The 2006 version of this standard was nearly identical to the ANSI Z535.1-2002 version, with an updated reference section and a new title, reflecting that the standard is meant to be used as a reference to define specific colors, not to set forth or codify the uses of these colors for specific purposes.

In 2010, the Z535.1 Subcommittee reviewed ANSI Z535.1-2006 and, not identifying any technical changes, recommended reaffirmation of the standard to the Z535 Committee. In its review, however, the Z535.1 Subcommittee made the following corrections:

In the references (Section 8), the address for Hale Color Charts, Inc. to read as follows:

Hale Color Charts, Inc., 4532 Court Way, Naples, FL 34109;

- In Table 1, corrected the following for Safety Orange:

Value + changed from 5.0YR 6.0/15 to 5.0YR 6.5/15
 Value – changed from 5.0YR 6.5/15 to 5.0YR 5.5/15
 Chroma + changed from 5.0YR 5.5/15 to 5.0YR 6.0/16;

- In Annex A, 6th paragraph, after "CIE 1930," replaced the box symbol with a degree symbol;
- In Figure 1, the centroid for each color was checked and relocated as necessary.

Proposals for improvement of this standard are welcome. Information concerning submittal of proposals to the ANSI Z535 Committee for consideration can be found at the back of this standard..

This standard was processed and approved for submittal to ANSI by the Accredited Standards Committee Z535 on Safety Signs and Colors. Committee approval of this standard does not necessarily imply that all committee members voted for its approval. At the time it reaffirmed this standard, the Z535 Committee had the following members:

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Richard Olesen, Vice Chair

Greg Winchester, Secretary

<i>Organization Represented:</i>	<i>Name of Representative:</i>
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American Welding Society	August F. Manz
Applied Materials	Edward Karl Carl Wong (Alt.)
Applied Safety and Ergonomics	Steve Hall Stephen Young (Alt.)
Association for Manufacturing Technology	David Felinski
Association of Equipment Manufacturers	Michael Weber Daniel Taylor (Alt.)
Browning Arms Company	Larry D. Nelson
Caterpillar, Inc.	Charles Crowell Mark Steffen (Alt.)
Clarion Safety Systems, LLC	Geoffrey Peckham
Dorris and Associates International, LLC	Nathan T. Dorris Alan Dorris (Alt.) Kelly Burke (Alt.)
Eagle Crusher Co.	Ryan Parsell
Edison Electric Institute	David Young

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Human Factors & Ergonomics Society	Michael Kalsher Michael S. Wogalter (Alt.)
Human Factors & Safety Analytics, Inc.	B. Jay Martin
Institute of Electrical & Electronics Engineers	Sue Vogel
International Safety Equipment Association	Janice Comer Bradley Christine Fargo (Alt.)
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Law Office of Mathew Kunding	Mathew Kunding
Marhefka & Associates	Russell E. Marhefka
National Association of Graphic Identification Manufacturers	Russ Butchko Donna Ehrmann (Alt.)
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Travelers Insurance Company	Karen Stetler
Underwriters Laboratories	Richard Olesen
Whirlpool Corporation	Deborah Sherman Donald Grob (Alt.)
World Kitchen, LLC	Celeste Levindoski

At the time it prepared this standard for Z535 Committee reaffirmation vote, Subcommittee Z535.1 on Safety Colors had the following members:

Donna Ehrmann, Co-Chair
Linda Moquet, Co-Chair
Paul Orr, Secretary

Lewis Barbe	World Safety Organization
Donna Ehrmann	National Association of Graphic and Product Identification Manufacturers
William N. Hale	Hale Color Consultants, Inc.
Road Heckman	RIT
Edward Karl	Applied Materials
Loren Mills	Safety and Forensic Enterprises, LLC
Linda Moquet	P&G Duracell, Inc.
Geoffrey Peckham	Clarion Safety Systems, LLC
Daniel Taylor	CNH

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For Safety Colors

1 Introduction

Color codes used on safety signs, labels and tags, as well as for the identification and location of fire extinguishers, first aid kits, traffic aiseways, stumbling and tripping hazards, etc., have been developed in the past by a large number of industrial firms and other organizations.

Although these color codes give satisfaction to those using them, they suffer from lack of uniformity. As a result, spontaneity of action in times of emergency can be lost, particularly by employees who have moved from one plant to another, when each has a different system.

This standard sets forth the specifications and test methods for safety colors in order to establish uniformity of safety color coding. As a result, the safety colors are the same as those used with:

ANSI Z535.2	<i>American National Standard Environmental and Facility Safety Signs</i>
ANSI Z535.3	<i>American National Standard Criteria for Safety Symbols</i>
ANSI Z535.4	<i>American National Standard Product Safety Signs and Labels</i>
ANSI Z535.5	<i>American National Standard Safety Tags and Barricade Tapes (for Temporary Hazards)</i>
ANSI Z535.6	<i>American National Standard Product Safety Information in Product Manuals, Instructions, and Other Collateral Material</i>
ANSI A13.1-1996 (R2002)	<i>American National Standard Scheme for the Identification of Piping Systems</i>
ANSI C95.2-1982 (R1988)	<i>American National Standard Radio Frequency Radiation Hazard Warning Symbol</i>
(see Section 8, References 10 and 11)	The Department of Transportation (DOT) Hazardous Materials Warning Labels and Placards; and the National Highway Traffic Safety Administration (NHTSA, DOT) Ambulance Orange and Ambulance Blue

Too many colors appearing simultaneously in the visual field can be both confusing and fatiguing. Study each location to minimize the number of markings, thereby enhancing the perceptual impact of the markings used.

2 Scope

This standard sets forth the technical definitions, color standards, and color tolerances for safety colors.

3 Purpose

3.1 Intent

The intent of ANSI Z535.1 is to establish a standard for safety colors that will alert and inform persons to take precautionary action or other appropriate action in the presence of hazards.

3.2 Engineering or administrative controls

This standard is not a substitute for engineering or administrative controls, including training, to eliminate identifiable hazards.