Approved American National Standard

ANSI Z535.1-2017

American National Standard for 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 with 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 with 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, 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 (R2011) 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 a 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 Commission Internationale de L'Eclairage (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 contains 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 of 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 uses 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 essential that candidate safety colors be examined under the actual light sources that will be used, This will 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 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 1931," replaced the box symbol with a degree symbol;
> In Figure 1, the centroid for each color was checked and relocated as necessary.

In 2012, the Z535.1 Safety Colors subcommittee recommended that the entire standard be revised, and that references to hazardous materials label and placard color tolerance charts be minimized due to their limited availability. These charts are no longer being produced or offered for sale, but are on display in the Office of Hazardous Materials Safety, Office of Hazardous Materials Standards, Washington, D.C.

ANSI Z535.1 *Safety Colors* is harmonizing with the Code of Federal Regulations, Title 49 Transportation, §172.407, Labeling Specifications. Tables 1, 2, and 3, Appendix A, will replace Table 1 in the Z535.1 standard. Tables 2 and 3 allow for differences in production methods and will help to ensure safety colors remain within their recommended tolerances. The Munsell Notations and chromaticity coordinates are identical in both the CFR Table 1 and ANSI Z535.1; the exception is how color is described. The new Table 1 is now more accessible to those unfamiliar with the Munsell Color System. An adjustment was made to the new Table 1 to include the original Munsell description of hue, value, and chroma into the Munsell Notation column.

The normative body of the standard has been simplified and designed as a tool for specifying safety colors consistently. Definitions or terms have been included so readers have a basic understanding of references made within the standard. More emphasis has been placed on what can affect a safety colors appearance and cause it to fall outside the acceptable tolerance limits rather than the technical measurement of safety colors which is beyond the scope of this standard. Fluorescent safety color information has been updated and expanded.

Realizing the need to make this standard more user-friendly and easy to understand, several new Annexes have been added. Annex A clarifies the color boundaries for Safety Yellow. Annex B illustrates ANSI safety color boundaries and ISO safety color boundaries together on a chromaticity diagram so one can see where ANSI safety colors plot in comparison to ISO safety colors. Annex C contains color cross-reference tables which include the Munsell notation, a PANTONE number, C-M-Y-K percentages, and an RGB formula for each ANSI and ISO safety color. Annex D has been added, and ISO safety colors and contrast colors of ordinary materials is shown in Table D-1. Annex E illustrates the Munsell Hue Circle and provides a visual detail of Hue, Value, and Chroma.

Safety Gray and Safety Brown have been eliminated from Table 1. These colors are in use by other signage systems but are not considered as hazard alerting colors for accident prevention. The PANTONE

colors originally specified in 2002 for the Safety Color Chart have been changed to harmonize with the PANTONE colors specified in the Code of Federal Regulations, Title 49 Transportation, § 172.407, section 5.

The following color standards in the PANTONE formula guide coated/uncoated may be used to achieve the required ANSI safety colors on markings and hazard warning labels and placards, see Table C-1.

For Red:	Use PANTONE 186 C
For Orange:	Use PANTONE 151 C
For Yellow:	Use PANTONE 109 C
For Green:	Use PANTONE 335 C
For Blue:	Use PANTONE 285 C
For Purple:	Use PANTONE 259 C

The original PANTONE colors referenced on the 2011 Safety Color Chart are acceptable for use as these colors are within safety color tolerances given in Table 1. Specification of the PANTONE colors listed here will be encouraged as they will replace the original PANTONE colors on the 2011 Safety Color Chart.

For compliance with ISO Safety Colors, see Annex C, Table C-2, and Table D-1. ISO safety colors fall within ANSI Z535.1 safety color tolerance boundaries as defined in Table 1 of this standard.

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 of approval, the Z535 Committee had the following members:

Geoffrey Peckham, Chair
J. Paul Frantz, Vice Chair
Paul Orr, Secretary

Organization Represented:	*Name of Representative:*
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	Timothy Rhoades (Alt.)
American Welding Society	August F. Manz
Applied Materials	Edward Karl
	Edwin Palmero (Alt.)
Applied Safety and Ergonomics	Steve Hall
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Whirlpool Corporation	Sondra McAndrew
	Evelyn Fisher (Alt.)
World Kitchen, LLC	Celeste Levindoski

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

Donna Ehrmann, Chair
Paul Orr, Secretary

Lewis Barbe, World Safety Organization
Donna Ehrmann, National Association of Graphic Product Identification Manufacturers
Judith J. Isaacson, Applied Safety and Ergonomics
Mike Kalsher, Human Factors and Ergonomics Society

1 Introduction

Safety colors are often used to supplement a word message or safety symbol. The standardization of safety colors assists with the efficient development of safety information as well as assisting viewers in recognizing information as being related to safety.

This standard provides specifications for producing consistent safety colors. The safety colors specified in ANSI Z535.1 *Safety Colors* are used by:

ANSI Z535.2   *Environmental and Facility Safety Signs*

ANSI Z535.3   *Criteria for Safety Symbols*

ANSI Z535.4   *Product Safety Signs and Labels*

ANSI Z535.5   *Accident Prevention Tags (for Temporary Hazards)*

ANSI Z535.6   *Product Safety Information in Product Manuals and Instructions and Other Collateral Materials*

2 Scope and Purpose

2.1 Scope

This standard provides a system for specifying safety colors, in terms of Munsell notations, CIE colorimetric data, defined chromaticity regions, and color formulas for each ANSI and ISO safety color used on safety signs, labels, and tags. It is beyond the scope of this standard to provide in-depth instructions for color measurement. It is beyond the scope of this standard to address the color of safety sign, label or tag substrates.