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January 19, 2016

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VIA EMAIL

Re: Clear and Reasonable Warning Regulations

Dear Ms. Vela:

On behalf of Applied Safety and Ergonomics, Inc., please accept this letter as a comment on the Office of Environmental Health Hazard Assessment's (OEHHA's) November 27, 2015 Proposed Rulemaking, proposing to replace California Code of Regulations Title 27, Article 6, "Clear and Reasonable Warnings," under the Safe Drinking Water and Toxic Enforcement Act of 1986.

For more than 20 years, Applied Safety and Ergonomics, Inc. (ASE) has provided product and occupational safety consulting services to a wide variety of businesses nationwide, including in the State of California. Our San Francisco office is headed by Steve Hall, who has been involved in developing national standards for product warnings for many years.

ASE has perhaps the largest group of consultants with expertise in product warnings, human factors/ergonomics, and safety management and is among the most widely published group of researchers and practitioners on the topic of warnings. We have been actively involved in the development of standards for warnings through the American National Standards Institute (ANSI), International Standards Organization (ISO), and other regulatory and standards-making bodies for more than 20 years. Our consultants also play an active role in the Society for Chemical Hazard Communication (SCHC), which recently renewed its formal alliance with the Occupational Safety and Health Administration (OSHA).

Perhaps most relevant to our comments, ASE is regularly called on by companies, organizations, and attorneys to answer questions about designing warnings and compliance with standards for warnings. We are drawing upon decades of practical experience in providing the following comments.

We have reviewed OEHHA's November 27, 2015 proposal and would like to recommend that OEHHA clarify the issues enumerated below before concluding its rulemaking process. We

believe that clarifying these concepts before promulgating a final rule will reduce the difficulty and uncertainty associated with compliance and simplify enforcement.

1. **Warning type size.** OEHHA's proposal requires that warnings be provided "in a type size no smaller than the largest type size used for other consumer information on the product" (e.g., §25602(a)(3), §25602(a)(3)).

   We recommend that OEHHA clarify how it intends type size to be measured. Note that if typefaces are not identical, it is not clear what constitutes "smaller" or "larger" type. For example, text in one typeface might be taller and narrower, while text in another typeface is shorter and wider. This situation would make it unclear how to enforce the rule. Similarly, OEHHA's minimum requirement of 6- or 8-point type might also be confusing to implement and enforce, as the actual size of 6- or 8- point text varies by typeface.

   One alternative used in other consumer products warning regulations, such as those promulgated under the Federal Hazardous Substances Act (FHSA), is to give type size requirements as capital letter heights in inches (see 16 CFR 1500.121, attached, and Figure 1 below).

Area of principal display panel in square inches	0–2	>2–5	>5–10	>10–15	>15–30	>30
Type size in inches *						
Signal word **	3/64	1/16	3/32	7/64	1/8	5/32
Statement of hazard	3/64	3/64	1/16	3/32	3/32	7/64
Other cautionary material ***	1/32	3/64	1/16	1/16	5/64	3/32

> means "greater than."
* minimum height of printed image of capital or upper case letters.
** including the word "poison" when required instead of a signal word by Section 3(b) of the Act (§ 1500.129).
*** size of lettering for other cautionary material is based on the area of the display panel on which such cautionary material appears.

Figure 1. Type size requirements excerpted from 16 CFR 1500.121.

We also recommend that OEHHA clarify what is meant by "other consumer information," both here and elsewhere in the proposed regulations. Does OEHHA intend for the specified warnings to be the largest text on the product? For example, should the warning be as large as text in the logo of a product such as that in Figure 2 below?

Figure 2. Example product with text in logo.

Note that warnings provided under FHSA are not required to be the largest text on the product, and that type size requirements are based on the size of the display panel (see Figure 1). Additionally, under FHSA, the type size of some cautionary information (e.g.,

on the back panel) is permitted to be smaller than the largest required cautionary information on the principal display panel. As an example, under FHSA, a consumer product might bear the words "WARNING, FLAMMABLE" or "DANGER, HARMFUL OR FATAL IF SWALLOWED" on the front panel, and other cautionary information (e.g., precautions to take to avoid fire or ingestion) on the back panel. For the smallest containers, the signal word ("WARNING" or "DANGER") and statement of hazard ("FLAMMABLE" OR "HARMFUL OR FATAL IF SWALLOWED") on the front panel might be 5/32 and 7/64 inches in height, respectively, and precautionary information on the back panel might be 3/32 inches in height.

Does OEHHA intend for their proposed warnings to be larger than other cautionary information on product labeling, such as that required under FHSA? Continuing the example above, if the OEHHA-specified warning were placed on the back panel, would OEHHA intend for this warning to be larger than the other cautionary information on that panel (i.e., as large as the warnings on the front panel)? Note that OEHHA's minimum 6- or 8-point type size requirement (e.g., §25602(a)(3), §25602(a)(3)) could also result in OEHHA-required warnings on the back panels of small containers being larger than other important warnings about immediate hazards that are required by FHSA.

2. **Symbol.** One of the required elements of the warnings in OEHHA's proposal is a symbol described as follows: "A symbol consisting of a black exclamation point in a yellow equilateral triangle with a bold black outline. Where the sign, label or labeling for the product is not printed using the color yellow, the symbol may be printed in black and white. The symbol shall be placed to the left of the text of the warning, in a size no smaller than the height of the word warning" (§25603(a)(1)).

   As the proposal is written, a number of questions could arise during compliance and enforcement regarding the shape, size, and color of OEHHA's symbol. For example:

   - If the symbol is placed on a black background (obscuring the bold black outline), is an additional yellow or white border required? If so, would the additional border considered part of the height of the symbol?
   - When black and white printing is used, should a black exclamation point on a white triangle or a white exclamation point on a black triangle be used?
   - What determines whether a product is "printed using the color yellow"? Does this refer to the ink used in the printing process[1] or to the colors displayed on the label? In both cases, without a clear specification for "yellow," how does OEHHA plan to resolve the potential ambiguity when a label or printing process[2] uses a color, such as gold or chartreuse, that may or may not be considered "yellow"? Would a black and white symbol be permitted in these cases?

[1] Common four-color printing processes mix cyan, magenta, yellow, and black ink to produce a wide range of colors, but a label printed using yellow ink will not necessarily have any recognizable yellow color on it, as the yellow may only be used in mixture to produce other colors.

[2] Printing processes using spot colors may use essentially any color ink, and generally cannot produce a full range of colors like a four-color CMYK process.

In light of these questions, we recommend that OEHHA clarify its requirements regarding the shape, size, and color of this symbol.

With regard to the color yellow, the proposed regulation includes no objective way to determine compliance, making enforcement difficult. Detailed color specifications, such as those provided in ANSI Z535.1, the American National Standard for Safety Colors (see Section 5, Table 1, and Figure 1, attached), can make compliance more measurable and objective; however, their technical complexity would make compliance more burdensome and increase the cost of designing labels, potentially requiring the use of color consultants to measure printed colors and determine compliance. Similar issues related to printing limitations were faced in the development of ANSI Z535.6, the American National Standard for Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials. ANSI Z535.6 permits safety alert symbols to be printed using either black and white or black and yellow, regardless of colors used elsewhere (see Sections 4.9.1, 5.3, and 5.3.1.2, attached). We recommend that OEHHA use a similar approach, allowing either black and white or black and yellow to be used.

3. **"Labels" and "on-product labels."** Sections 25602(a)(1) and (a)(2) include requirements for labels and on-product labels, respectively. The definition of "label" ("a display of written, printed or graphic material that is affixed to a product or its immediate container or wrapper," §25600.1(f)) seems to indicate an on-product label, but "on-product label" is not defined. Given that the requirements for "labels" and "on-product labels" are different, but that the terms seem to refer to the same thing, manufacturers will have difficulty determining which set of requirements to follow for their on-product warnings. We recommend that OEHHA clarify the distinction between "label" and "on-product label," as well as when requirements for each would apply.

Sincerely,

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Attachments:

Attachment 1
16 CFR 1500.121, 1-1-15 edition

Attachment 2
ANSI Z535.1-2006 (reaffirmed 2011), Section 5, Table 1, and Figure 1

Attachment 3
ANSI Z535.6-2011, Sections 4.9.1, 5.3, and 5.3.1.2

Attachment 1

16 CFR 1500.121, 1-1-15 edition

limited to, animal glue, bee's wax, seeds, nut shells, flowers, bone, sea shell, coral, amber, feathers, fur, leather.

(e) The following metals and alloys do not exceed the lead content limits under section 101(a) of the CPSIA, provided that no lead or lead-containing metal is intentionally added but does not include the non-steel or non-precious metal components of a product, such as solder or base metals in electroplate, clad, or fill applications:

(1) Surgical steel and other stainless steel within the designations of Unified Numbering System, UNS S13800–S66286, not including the stainless steel designated as 303Pb (UNS S30360).

(2) Precious metals: Gold (at least 10 karat); sterling silver (at least 925/1000); platinum; palladium; rhodium; osmium; iridium; ruthenium, titanium.

[74 FR 43041, Aug. 26, 2009]

§ 1500.121 Labeling requirements; prominence, placement, and conspicuousness.

(a)(1) *Background and scope.* Section 2(p)(1) of the Federal Hazardous Substances Act (FHSA) or "the Act"), 15 U.S.C. 1261(p)(1), requires that hazardous substances bear certain cautionary statements on their labels. These statements include: signal words; affirmative statements of the principal hazard(s) associated with a hazardous substance; the common or usual name, or chemical name, of the hazardous substance; the name and place of business of the manufacturer, packer, distributor, or seller; statements of precautionary measures to follow; instructions, when appropriate, for special handling and storage; the statement "Keep Out of the Reach of Children" or its practical equivalent; and, when appropriate, first-aid instructions. Section 2(p)(2) of the Act specifies that all such statements shall be located prominently on the label of such a substance and shall appear in conspicuous and legible type in contrast by typography, layout, or color with other printed matter on the label. This regulation contains the Commission's interpretations and policies for the type size and placement of cautionary material on the labels of hazardous substances and contains other criteria for such cautionary statements that are acceptable to the Commission as satisfying section 2(p)(2) of the Act. Labels that do not comply with this regulation may be considered misbranded.

(2) *Definitions.* For the purposes of this section:

(i) *Container* means the immediate package from which a hazardous substance may be dispensed and also any article, package or wrapping, such as a tube or cone used for a firework or a wet cell battery casing containing sulfuric acid, which is necessary for the substance to function during actual use.

(ii) *Cautionary material, cautionary labeling,* and *cautionary labeling required by the Act* mean all items of labeling information required by sections 2(p)(1) of the FHSA (repeated in 16 CFR 1500.3(b)(14)(i) or by the regulations which require additional labeling under section 3(b) of the Act.

(iii) *Display panel* means any surface of the immediate container, and of any outer container or wrapping, which bears labeling.

(iv) *Principal display panel* means the portion(s) of the surface of the immediate container, and of any outer container or wrapping, which bear(s) the labeling designed to be most prominently displayed, shown, presented, or examined under conditions of retail sale. (See paragraph (c)(1) of this section.)

(v) *Type size* means the actual height of the printed image of each upper case or capital letter as it appears on the label of a hazardous substance. (See paragraph (c)(2) of this section.)

(vi) *Signal word* means the appropriate word "DANGER," "WARNING," or "CAUTION," as required by sections 2(p)(1) (C) or (D) of the Act.

(vii) *Statement of principal hazard(s)* means that wording descriptive of the principal or primary hazard(s) associated with a hazardous substance required by section 2(p)(1)(E) of the Act. Some examples of such statements are "HARMFUL OR FATAL IF SWALLOWED," "VAPOR HARMFUL," "FLAMMABLE," and "SKIN AND EYE IRRITANT."

(viii) *Other cautionary material* means all labeling statements, other than

"signal words" or "statement(s) of principal hazard(s)," required by the Act or by regulations issued under the Act.

(b) *Prominent label placement.* To satisfy the requirement of the Act that cautionary labeling statements shall appear "prominently" on the label of a hazardous substance, all such statements shall be placed on the label as follows:

(1) *Horizontal placement of labeling statements.* Except for the name and place of business of the manufacturer, packer, distributor, or seller, all cautionary material required by the Act shall appear in lines that are generally parallel to any base on which the package rests as it is designed to be displayed for sale or, on display panels other than the principal display panel, in lines generally parallel to all other labeling on that panel. This requirement does not apply to labeling on collapsible tubes, cylindrical containers with a narrow diameter, or F-type containers where both the "front" and "back" of the container are principal display panels. (See paragraph (e) of this section.)

(2) *Principal display panel labeling.* (i) All items of cautionary labeling required by the Act may appear on the principal display panel on the immediate container and, if appropriate, on any other container or wrapper. See paragraph (b)(4) of this section for requirements and exceptions for labeling outer containers and wrappings.

(ii) The signal word, the statement of principal hazard(s), and, if appropriate, instructions to read carefully any cautionary material that may be placed elsewhere on the label shall be blocked together within a square or rectangular area, with or without a border, on the principal display panel on the immediate container and, where required by paragraph (b)(4) of this section, on any outer container or wrapping. All cautionary statements placed on the principal display panel shall be separated on all sides from other printed or graphic matter, with the exception of the declaration of net contents required under the Fair Packaging and Labeling Act, 15 U.S.C. 1453(a) (2) and (3), by a border line or by a space no smaller than the minimum allowable height of the type size for cautionary material required by the Act (exclusive of signal words and statements of hazard) on the principal display panel.

(iii) Depending on the design of the package or the configuration of the label, or both, a package may have more than one principal display panel. If so, each principal display panel must bear, at a minimum, the signal word, statement of principal hazard or hazards, and, if appropriate, instructions to read carefully any cautionary material that may be placed elsewhere on the label.

(A) Where the principal display panel of the immediate container consists of a lid, cap, or other item which may be separated from the immediate container and discarded, the container shall be deemed to have a second principal display panel elsewhere on the immediate container which must bear, at a minimum, the signal word, statement of principal hazard(s), and instructions, if appropriate, to read any cautionary material which may be placed elsewhere on the label.

(3) *Prominent label placement—other display panel labeling.* All items of cautionary labeling required by the Act which do not appear on the principal display panel shall be placed together on a display panel elsewhere on the container. The name and place of business of the manufacturer, packer, distributor, or seller may appear separately on any display panel. Where cautionary material appears on a display panel other than the principal display panel, the principal display panel shall bear the statement "Read carefully other cautions on the _____ panel," or its practical equivalent. [A description of the location of the other panel is to be inserted in the blank space.]

(4) *Outer container or wrappings.* All cautionary labeling appearing on the immediate container of a hazardous substance shall also appear on any outer container or wrapping used in the retail display of the substance, in the same manner as required for the immediate container. Those cautionary labeling statements appearing on the immediate container which are clearly legible through any outer container or wrapper used in retail display need not appear on the outer container

or wrapping itself. (See section 2(n)(1) of the Act.)

(5) *Placement of the word "Poison" and the skull and crossbones symbol.* The word "poison" and, when appropriate, the skull and crossbones symbol shall appear on the label of a hazardous substance as follows:

(i) If a hazardous substance is "highly toxic," as defined in §1500.3(c)(i) and section 2(h)(1) of the FHSA, the label must bear the word "poison" in accordance with section 2(p)(1)(H) of the Act, in addition to the signal word "DANGER," and must also bear the skull and crossbones symbol. Some products, under §1500.14(b) of the regulations, may, in addition to any required signal word, be required to bear the word "poison" and the skull and crossbones symbol because of the special hazard associated with their ingredients. In both instances, the word "poison" and the skull and crossbones symbol need not appear on the principal display panel on the container, unless all other cautionary labeling required by the Act appears on the principal display panel. The word "poison" and the skull and crossbones symbol, when required, must appear either together with other cautionary labeling on a display panel other than the principal display panel or together with the signal word and statement(s) of principal hazard on the principal display panel.

(ii) Where, pursuant to a regulation issued under section 3(b) of the Act, the label of a hazardous substance requires the word "poison" instead of a signal word, the word, "POISON" shall appear in capital letters on the principal display panel, together with the statement(s) of the principal hazard. Certain substances for which the word "poison" is required instead of any signal word are listed in §1500.129.

(c) *Conspicuousness—type size and style.* To satisfy the requirement that cautionary labeling statements under the Act be conspicuous and legible, such statements shall conform to the following requirements:

(1) *Area of principal display panel.* The area of the principal display panel is the area of the side or surface of the immediate container, or of the side or surface of any outer container or wrapping, that bears the labeling designed to be most prominently displayed, shown, presented, or examined under conditions of retail sale. This area is not limited to the portion of the surface covered with labeling; rather, it includes the entire surface. Flanges at the tops and bottoms of cans, conical shoulders of cans, handles, and shoulders and necks of bottles and jars are excluded in measuring the area. For the purposes of determining the proper type size for cautionary labeling, the area of the principal display panel (or other panel bearing cautionary labeling, under paragraph (c)(2)(ii) of this section) is to be computed as follows:

(i) In the case of a rectangular package, where one entire side is the principal display panel, the product of the height times the width of that side shall be the area of the principal display panel.

(ii) In the case of a cylindrical or nearly cylindrical container or tube on which the principal display panel appears on the side, the area of the principal display panel shall be 40 percent of the product of the height of the container times its circumference.

(iii) In the case of any other shape of container, the area of the principal display panel shall be 40 percent of the total surface of the container, excluding those areas, such as flanges at tops and bottoms, specified in paragraph (c)(1) above. However, if such a container presents an obvious principal display panel (such as an oval or hourglass shaped area on the side of a container for dishwashing detergent), the area to be measured shall be the entire area of the obvious principal display panel.

(2) *Type-size requirements.* (i) The term *type size* refers to the height of the actual printed image of each upper case or capital letter as it appears on the label. The size of cautionary labeling shall be reasonably related to the type size of any other printing appearing on the same panel, but in any case must meet the minimum size requirements in table 1.

(ii) When an item of labeling is required to be in a specified type size, all upper case, or capital, letters must be at least equal in height to the required type size, and all other letters must be the same style as the upper case or

capital letters. Unless otherwise specified in the regulations (examples appear at §§1500.14(b)(6), 1512.19, 1508.9, and part 1505), the type size of all cautionary statements appearing on any display panel shall comply with the specifications in table 1 when the area of the display panel is measured by the method in paragraph (c)(1) above:

TABLE I

Area of principal display panel in square inches	0–2	>2–5	>5–10	>10–15	>15–30	>30
Type size in inches *						
Signal word **	3/64	1/16	3/32	7/64	1/8	5/32
Statement of hazard	3/64	3/64	1/16	3/32	3/32	7/64
Other cautionary material ***	1/32	3/64	1/16	1/16	5/64	3/32

> means "greater than."
* minimum height of printed image of capital or upper case letters.
** including the word "poison" when required instead of a signal word by Section 3(b) of the Act (§1500.129).
*** size of lettering for other cautionary material is based on the area of the display panel on which such cautionary material appears.

(iii) If all of the required cautionary labeling does not appear on the principal display panel, the statement to "Read carefully other cautions on the _____ panel," or its practical equivalent, must appear in, as a minimum, the same type size as that required in table 1 for the other cautionary material which appears elsewhere on the label of a hazardous substance. The size of the cautionary labeling that does not appear on the principal display panel is determined by the area of the panel on which it does appear.

(3) *Type style—proportion.* The ratio of the height of a capital or uppercase letter to its width shall be such that the height of the letter is no more than 3 times its width.

(4) *Signal word and statements of hazard—capital letters.* The signal word, the word "poison" if required instead of a signal word (see §1500.129), and the statement of principal hazard or hazards shall be in capital letters.

(5) *Multiple statement of hazard—type size and style.* All statements of principal hazard or hazards on a label shall appear in the same size and style of type, and shall appear in the same color or have the same degree of boldness.

(6) *Accompanying literature containing directions for use.* Where literature accompanying the package of a hazardous substance has directions for use, written or otherwise, section 2(n) of the Act requires the literature to bear cautionary labeling.

(i) All such cautionary labeling shall be in reasonable proximity to any direction for use and shall be placed together within the same general area.

(ii) The type size of such cautionary labeling shall be reasonably related to the type size of any other printed matter in the accompanying literature and must be in conspicuous and legible type by typography, layout, or color with other printed matter on the label. The signal word and statement of principal hazard or hazards shall appear in capital letters.

(d) *Conspicuousness—contrast.* To satisfy the requirement that cautionary labeling statements appear in conspicuous and legible type which is in contrast by typography, layout, or color with the other printed matter on the label, such statements shall conform to the following requirements:

(1) *Color.* Where color is the primary method used to achieve appropriate contrast, the color of any cautionary labeling statement shall be in sharp contrast with the color of the background upon which such a statement appears. Examples of combinations of colors which may not satisfy the requirement for sharp contrast are: black letters on a dark blue or dark green background, dark red letters on a light red background, light red letters on a reflective silver background, and white letters on a light gray or tan background.

(2) *Interference with conspicuousness—labeling design, vignettes, or other printed material.* For cautionary information appearing on panels other than the principal display panel, the label design, the use of vignettes, or the proximity of other labeling or lettering

shall not be such that any cautionary labeling statement is obscured or rendered inconspicuous.

(e) *Collapsible metal tubes.* Collapsible metal tubes containing hazardous substances shall be labeled so that all cautionary labeling required by the Act appears as close to the dispensing end of the container as possible. The placement and conspicuousness of these statements shall conform to the provisions of paragraphs (b), (c), and (d) of this section.

(f) *Unpackaged hazardous substances.* Where practicable, unpackaged hazardous substances intended, or distributed in a form suitable, for use in or around a household or by children shall be labeled so that all items of information required by the Act appear upon the article itself. In instances where this is impracticable (for example, because of the size or nature of the article), the required cautionary labeling must be displayed by means of a tag or other suitable material that is no less than five square inches in area and is securely affixed to the article so that the labeling will remain attached throughout conditions of merchandising and distribution to the ultimate consumer. The placement and conspicuousness of all cautionary labeling appearing on such a tag or material, or on an unpackaged article, shall conform to the provisions of paragraphs (b), (c), and (d) of this section. For the purposes of determining the proper type size to use on a tag or other material, the area of one side of the tag or other material shall be the area of the principal display panel.

(g) *Exemptions.* All requirements of the Act are satisfied by compliance with this §1500.121. However, exemptions can be granted under section 3(c) of the Act and §1500.83, or under the provisions of another statute should this section be incorporated in regulations under another statute. Section 1500.82 contains the requirements for exemption requests under the Federal Hazardous Substances Act.

(h) *Effective date.* The provisions of this rule apply to hazardous substances bearing labels printed after December 30, 1985. Labels printed prior to the effective date of this rule may be applied until not later than December 28, 1987. This rule applies to all hazardous substances to which labels are applied after December 28, 1987.

[49 FR 50383, Dec. 28, 1984]

§1500.122 Deceptive use of disclaimers.

A hazardous substance shall not be deemed to have met the requirements of section 2(p) (1) and (2) of the act (repeated in §1500.3(b)(14) (i) and (ii)) if there appears in or on the label (or in any accompanying literature; words, statements, designs, or other graphic material that in any manner negates or disclaims any of the label statements required by the act; for example, the statement "Harmless" or "Safe around pets" on a toxic or irritant substance.

§1500.123 Condensation of label information.

Whenever the statement of the principal hazard or hazards itself provides the precautionary measures to be followed or avoided, a clear statement of the principal hazard will satisfy the requirements of section 2(p)(1) (E) and (F) of the act (repeated in §1500.3(b)(14)(i) (E) and (F)). When the statement of precautionary measures in effect provides instruction for first-aid treatment, the statement of the precautionary measures will satisfy the requirements of section 2(p)(1) (F) and (G) of the act (repeated in §1500.3(b)(14)(i) (F) and (G)).

§1500.125 Labeling requirements for accompanying literature.

When any accompanying literature includes or bears any directions for use (by printed word, picture, design, or combination thereof), such placard, pamphlet, booklet, book, sign, or other graphic or visual device shall bear all the information required by section 2(p) of the act (repeated in §1500.3(b)(14)).

§1500.126 Substances determined to be "special hazards."

Whenever the Commission determines that for a particular hazardous substance intended or packaged in a form suitable for use in the household or by children, the requirements of section 2(p) of the act (repeated in

Attachment 2

ANSI Z535.1-2006 (reaffirmed 2011), Section 5, Table 1, and Figure 1

American National Standard

ANSI Z535.1-2006 (R2011)

Reaffirmation of ANSI Z535.1-2006

American National Standard

Safety Colors

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
1300 NORTH 17TH STREET, ROSSLYN, VA 22209
(703) 841-3200 (703) 841-3300

ANSI Z535.1-2006 (R2011)
Reaffirmation of
ANSI Z535.1-2006

American National Standard

Safety Colors

Secretariat:

National Electrical Manufacturers Association

Approved February 16, 2006
Published January 31, 2007
Reaffirmed July 19, 2011

American National Standards Institute, Inc.

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3.3 Existing American National Standards

There are a number of existing American National Standards, which are recognized for particular industries or specific uses. Compliance with these standards may be considered for such particular industries or uses. It is not the intent of ANSI Z535.1 to replace existing standards or regulations, which are uniquely applicable to a specific industry or use. It is the intent to encourage adoption of this standard in subsequent revisions of other standards and regulations.

4 Application

4.1 Colors specified

The colors specified in this standard are intended for use on safety signs, symbols, and safety messages in collateral materials as set forth by other Z535 standards. See Z535.2, Z535.3, Z535.4, Z535.5, and Z535.6.

4.2 Specifications for safety colors

This standard sets forth the specifications of the safety colors for as wide a range of materials as possible to satisfy the many applications for these colors.

4.3 Illumination

Safety signs that are color coded and for which illumination must be provided shall be illuminated to levels which will permit positive identification of the color safety signs and shall be illuminated with a light source which will not overly distort the color and, therefore, the message the color identification conveys.

4.4 Optimum visibility

To ensure optimum visibility, colors selected for safety signs should have maximum color contrast, especially lightness contrast. Likewise, contrast must be achieved between the sign and its visual environment. Thus, dark colors (red, brown, green, blue, and purple) should be used with white letters, while light colors (orange and yellow) are better seen contrasted with black.

5 Color specifications and test methods for ordinary surface colors

5.1 Color specifications

5.1.1 Primary color specifications

The primary color specifications are in terms of the Munsell Notation System, a color identification and specification system based on uniform visual spacing as described in Standard Practice for Specifying Color by the Munsell System, ASTM D1535 (see Section 8, Reference 16). Table 1 lists the Munsell notations for each standard and its surrounding tolerance limits, and provides equivalent data in the CIE 1931 system for use in Section 5.3.

5.1.2 Color tolerance charts

The Color Tolerance Charts designed for use with this standard (see Section 5.2.1 and Section 8, Reference 17) display the standard color and three pairs of tolerance colors, representing the upper (+) and lower (-) limits for the visual attributes of hue, value and chroma. Table 1 shows the Munsell notations for each of these seven colors and the equivalent CIE x,y,Y data, for CIE Standard Illuminant C and the 2¡ CIE 1931 Standard Observer. Table 1 also gives the boundary equations of permissible areas on the CIE 1931 Chromaticity Diagram and the luminous reflectance of the standard (Y). Figure 1 shows the CIE 1931 Chromaticity Diagram on which the permissible areas are defined by the boundary equations and the color names and Munsell Notations for each Safety Color.

5.1.3 Safety white

The specification for Safety White (a neutral) is given in Table 1. The intent of the permissible color range specified in Table 1 for Safety White is to permit greater deviation from neutral white in the red to orange to yellow hue range, and lesser deviation in the rest of the hue circle. This deviation is necessary because most white colorants are really off-whites in the red-to-yellow range. Ageing of white also results in shifts in the same direction. Because it is difficult to express this transition between chroma levels with change

in hue without listing a large number of data points, users should be guided by the ovoid shown in Figure 2.

5.1.4 Maximum recognition

The colors in this standard have been chosen to provide maximum feasible recognition by both normal and color-deficient (specifically red-green confusing) observers.

5.2 Visual test method

The visual specifications and test methods for daytime color are contained in the Hazardous Materials Labels and Placards Color Tolerance Charts adopted by the U.S. Department of Transportation, Research and Special Programs Administration (see Section 8, Reference 17).

5.2.1 Visual reference standards

Testing for compliance shall be by visual examination using visual reference standards annotated with Munsell notations, and appropriate to the color region of interest. Such standards include the Hazardous Materials Labels and Placards Color Tolerance Charts, appropriate colors from the Munsell Book of Color (see Section 8, Reference 18), and other color samples whose values have been determined by instrumental measurement and converted to Munsell notation, provided that the restrictions of 76.2.3 are observed. Visual examination shall be conducted in accordance with ASTM D1729 (see Section 8, Reference 19), Standard Practice for Visual Examination of Color Differences of Opaque Materials.

5.2.2 Visual test conditions

Testing for compliance by visual examination shall be limited to cases in which the specimens to be tested and the visual reference standards have similar spectral characteristics; that is, the specimens shall not be noticeably metameric to the standards as judged by ASTM D4086 (see Section 8, Reference 20), Standard Practice for Visual Evaluation of Metamerism. If these conditions are met, the test for compliance shall be made under actual daylight or any source designated for color matching of appropriate daylight quality, and by any observer having normal color vision.

5.3 Instrumental test method

5.3.1 Instrumental color specification for each color

The instrumental color specification for each color is a set of CIE 1931 chromaticity coordinates, x, y, and luminous reflectance Y, calculated for CIE Standard Illuminant C and the CIE 1931 2° Standard Observer. These data are equivalent to the Munsell notations described in Section 7.1.1. From them are derived boundary equations defining areas in CIE color space (CIE 1931 Chromaticity Diagram) at the luminous reflectance of the standard (Y), as listed in Table 1. The permissible areas appear on Figures 1 and 2.

5.3.2 Use of spectrophotometers

Testing for compliance can be done through the use of spectrophotometers designed to measure reflecting materials, with the data processed to yield CIE x, y, Y data for Standard Illuminant C and the CIE 1931 2° Standard Observer. The primary standard for reflectance shall be the perfect reflecting diffuser as defined by the CIE. See ASTM E1164 (see Section 8, Reference 21) *Standard Practice for Obtaining Spectrophotometric Data for Object Color Evaluation*; ASTM E308 (see Section 8, Reference 22) *Standard Method for Computing the Colors of Objects by Using the CIE System*; or ASTM D2244 (see Section 8, Reference 23) *Test Method for Calculation of Color Differences From Instrumentally Measured Color Coordinates*.

6 Color specifications and test methods for retroreflective materials

6.1 General

Specifications and test methods are available for a series of seven colors used by the Federal Highway Administration. It is recommended that these specifications and test methods be used because the colors are quite close to Safety Red, Safety Orange, Safety Yellow, Safety Green and Safety Blue.

Table 1
Specifications of the Safety Colors for CIE Illuminant C (Representative of Overcast North Sky Daylight) and the CIE 1931, 2° Standard Observer

Color Names	Standard and Tolerances	Munsell Notation Specifications		Equivalent CIE Data Specifications			Boundary Equations on the CIE 1931 Chromaticity Diagram	
		Hue	Value/Chroma	x	y	Y%		
Safety Red	Standard	7.5R	4.0/14	0.5959	0.3269	12.00	Purple	y = 0.4181 - 0.1700x
	Hue +	8.5R	4.0/14	0.6037	0.3389	12.00	White	y = 1.1084x - 0.2892
	Hue -	6.5R	4.0/14	0.5869	0.3184	12.00	Orange	y = 0.4054 - 0.1099x
	Value +	7.5R	4.5/14	0.5775	0.3320	15.57		
	Value -	7.5R	3.5/14	0.6226	0.3141	9.00		
	Chroma +	7.5R	4.0/16	0.6260	0.3192	12.00		
	Chroma -	7.5R	4.0/12	0.5603	0.3321	12.00		
Safety Orange	Standard	5.0YR	6.0/15	0.5510	0.4214	30.05	Red	y = 0.2678 + 0.2545x
	Hue +	6.25YR	6.0/15	0.5452	0.4329	30.05	White	x = 0.5331
	Hue -	3.75YR	6.0/15	0.5552	0.4091	30.05	Yellow	y = 0.3722x + 0.2301
	Value +	5.0YR	6.5/15	0.5427	0.4206	36.20		
	Value -	5.0YR	5.5/15	0.5606	0.4218	24.58		
	Chroma +	5.0YR	6.0/16	0.5597	0.4239	30.05		
	Chroma -	5.0YR	6.0/13	0.5311	0.4154	30.05		
Safety Brown	Standard	5.0YR	2.75/5	0.4766	0.3816	5.52	Red	y = 0.2317 + 0.2729x
	Hue +	7.0YR	2.75/5	0.4762	0.3981	5.52	White	x = 0.4450
	Hue -	2.5YR	2.75/5	0.4728	0.3607	5.52	Yellow	y = 0.1636 + 0.4926x
	Value +	5.0YR	3.25/5	0.4608	0.3801	7.71		
	Value -	5.0YR	2.25/5	0.4955	0.3826	3.82		
	Chroma +	5.0YR	2.75/6	0.5081	0.3912	5.52		
	Chroma -	5.0YR	2.75/4	0.4450	0.3720	5.52		
Safety Yellow	Standard	5.0Y	8.0/12	0.4562	0.4788	59.10	Orange	y = 0.9837x + 0.0112
	Hue +	6.5Y	8.0/12	0.4498	0.4865	59.10	White	x = 1.1007 - 1.4631x
	Hue -	3.5Y	8.0/12	0.4632	0.4669	59.10	Green	y = 1.2183x - 0.0615
	Value +	5.0Y	8.5/12	0.4508	0.4754	68.40		
	Value -	5.0Y	7.5/12	0.4620	0.4823	50.68		
	Chroma +	5.0Y	8.0/14	0.4699	0.4920	59.10		
	Chroma -	5.0Y	8.0/10	0.4376	0.4601	59.10		

Table continued on next page

Table 1 continued

Color Names	Standard and Tolerances	Munsell Notation Specifications		Equivalent CIE Data Specifications			Boundary Equations on the CIE 1931 Chromaticity Diagram	
		Hue	Value/Chroma	x	y	Y%		
Safety Green	Standard	7.5G	4.0/9	0.2111	0.4121	12.00	Yellow	y = 0.7598 - 1.4306x
	Hue +	0.5BG	4.0/9	0.1974	0.3809	12.00	White	y = 1.8471x - 0.0417
	Hue -	5.0G	4.0/9	0.2237	0.4399	12.00	Blue	y = 0.4935 - 0.5714x
	Value +	7.5G	4.5/9	0.2204	0.4060	15.57		
	Value -	7.5G	3.5/9	0.2027	0.4163	9.00		
	Chroma +	7.5G	4.0/11	0.1848	0.4319	12.00		
	Chroma -	7.5G	4.0/7	0.2350	0.3922	12.00		
	Chroma - -tt	7.5G	4.0/6	0.2467	0.3822	12.00		
Safety Blue	Standard	2.5PB	3.5/10	0.1691	0.1744	9.00	Green	y = 0.8725x + 0.457
	Hue +	4.5PB	3.5/10	0.1796	0.1711	9.00	White	y = 0.2852 - 0.4696x
	Hue -	10.0B	3.5/10	0.1557	0.1815	9.00	Purple	y = 1.1134x - 0.0290
	Value +	2.5PB	4.0/10	0.1805	0.1888	12.00		
	Value -	2.5PB	3.0/10	0.1576	0.1600	6.55		
	Chroma +	2.5PB	3.5/12	0.1516	0.1547	9.00		
	Chroma -	2.5PB	3.5/8	0.1888	0.1964	9.00		
Safety Purple	Standard	10.0P	4.5/10	0.3307	0.2245	15.57	Blue	y = 30.8485x - 9.2485
	Hue +	2.5RP	4.5/10	0.3584	0.2377	15.57	White	y = 0.4644x + 0.0869
	Hue -	7.5P	4.5/10	0.3068	0.2145	15.57	Red	y = 0.8209 - 1.6273x
	Value +	10.0P	5.0/10	0.3308	0.2328	19.77		
	Value -	10.0P	4.0/10	0.3306	0.2162	12.00		
	Chroma +	10.0P	4.5/12	0.3333	0.2100	15.57		
	Chroma -	10.0P	4.5/8	0.3280	0.2391	15.57		
	Chroma - -tt	10.0P	4.5/6.5	0.3254	0.2519	15.57		
Safety White	Standard		N9.0/	0.3101	0.3163	78.00	See Figure 2	
	Hue +			-	-			
	Hue -			-	-			
	Value +		N9.5/	-	-	90.00		
	Value -		N8.75/	-	-	73.40		
	Chroma +		/1.0 (5R-5Y)	-	-			
			/0.5 (5G-5P)	-	-			
	Chroma -		/0.0		-			

Table continued on next page

Table 1 continued

Color Names	Standard and Tolerances	Munsell Notation Specifications		Equivalent CIE Data Specifications			Boundary Equations on the CIE 1931 Chromaticity Diagram
		Hue	Value/Chroma	x	y	Y%	
Safety Gray	Standard		N 5.0/	0.3101	0.3163	19.80	See Figure 2
	Hue +			-	-		
	Hue -			-	-		
	Value +		N 5.5/		-	24.60	
	Value -		N 4.5/		-	15.60	
	Chroma +		/0.5		-		
	Chroma		/0.0				
Safety Black	Standard		N 1.5/	0.3101	0.3163	2.02	See Figure 2
	Hue +			-	-		
	Hue -			-	-		
	Value ++		N 2.5/**		-	4.61	
	Value +		N 2.0/		-	3.13	
	Value -		N 0.5/		-	0.58	
	Chroma +		/0.5				
	Chroma		/0.0				

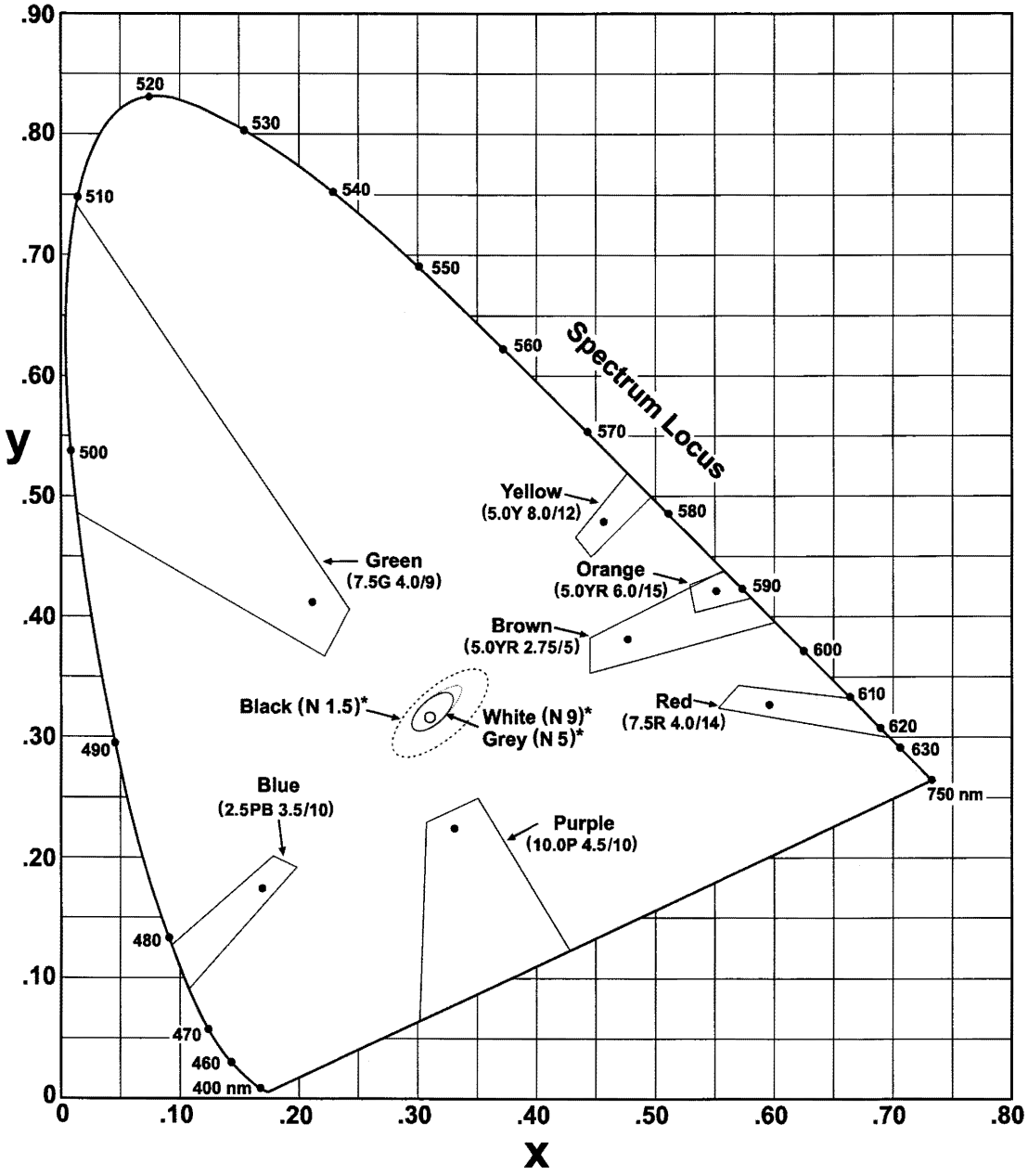
NOTES:

* Safety Red, Safety Orange, Safety Yellow, Safety Green, Safety Blue, Safety Purple, and Safety Brown colors may be stronger (more saturated), than the C+ (plus) color as long as they comply with the hue and value tolerances. White Safety Colors may be lighter (higher value) than the V+ (plus) color, and Black Safety Colors may be darker (lower value) than the V- (minus) color as long as each complies with the applicable hue and chroma tolerances.

† The Y values in Table 1 apply to the colors of glossy or matte reflecting samples and may not be appropriate for the colors of fluorescent or retroreflective samples.

** V++ for matte Safety Blacks only. For the purpose of this standard, Matte is defined as having a 60° gloss of less than 30 (ASTM D 523).

†† Porcelain enamel only.



Note: The small circles inside each color limit area identifies the centroid for each color.

***See Figure 2 for an enlarged view of the white, grey and black limit areas.**

Figure 1
CIE 1931 Chromaticity Diagram Showing the Areas Representing the ANSI Z535.1 Safety Colors

Attachment 3

ANSI Z535.6-2011, Sections 4.9.1, 5.3, and 5.3.1.2

ANSI Z535.6-2011

Revision of ANSI Z535.6-2006

American National Standard

Product Safety Information in Product Manuals, Instructions, and Other Collateral Materials

ANSI Z535.6-2011
Revision of
ANSI Z535.6-2006

American National Standard

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Secretariat:

National Electrical Manufacturers Association

Approved July 19, 2011
Published September 15, 2011
Contains November 1, 2011 Errata

American National Standards Institute, Inc.

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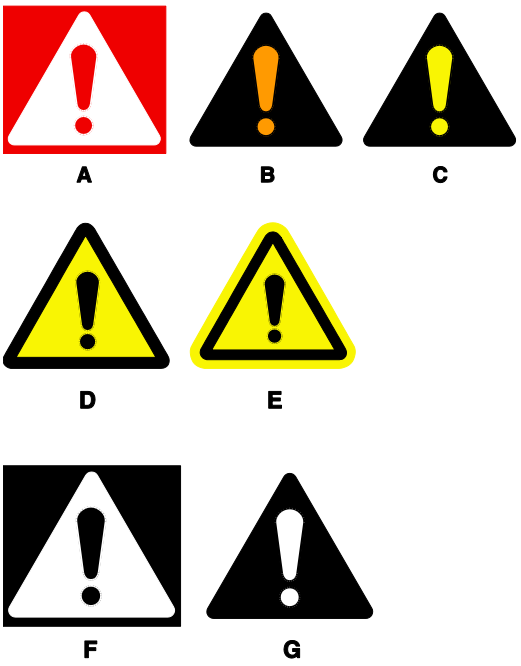
4.7.3 section safety messages: Safety messages that apply to entire sections, subsections, or multiple paragraphs or procedures within a document. These messages apply to larger units of information than embedded safety messages and typically appear at the beginning of the section to which they apply.

4.7.4 embedded safety messages: Safety messages that apply to a specific part of a section, a paragraph, a particular procedure or part of a procedure, a particular sentence, etc. in a document. These messages apply to smaller units of information than do section safety messages and are integrated within procedures or other text.

4.8 property damage messages: Word messages that provide information primarily about situations that can lead to property damage, the potential consequences of not avoiding the situations, or method(s) for avoiding the situations; or that direct readers to such information. Messages about hazards that could result in both physical injury and property damage are considered safety messages, not property damage messages.

4.9 safety symbol: A graphic representation intended to convey a message without the use of words. It may represent a hazard, a hazardous situation, a precaution to avoid a hazard, a result of not avoiding a hazard, or any combination of these messages. See ANSI Z535.3-2011.

4.9.1 safety alert symbol: A symbol that indicates a hazard. It is composed of an equilateral triangle surrounding an exclamation mark. The safety alert symbol shall not be used to alert persons of property-damage only accidents.



(A) for use with DANGER signal word (white triangle, safety red exclamation mark, and safety red background)
(B) for use with WARNING signal word (black triangle, safety orange exclamation mark)
(C) for use with CAUTION signal word (black triangle, safety yellow exclamation mark)

(D) and (E) for use with DANGER, WARNING, or CAUTION signal words or no signal word ([D] has a safety yellow background, black border, and black exclamation mark; [E] has a safety yellow border around a black band.)

NOTE—D and E are provided to allow for consistency with certain ISO standards, such as ISO 3864-1 and ISO 3864-2.

(F) and (G) for use with DANGER, WARNING, or CAUTION signal words or no signal word

Figure 1
Safety alert symbols

4.10 signal words: A word that calls attention to a safety message or messages or a property damage message or messages, and designates a degree or level of hazard seriousness. The signal words in this standard are “DANGER,” “WARNING,” “CAUTION,” and “NOTICE.”

4.10.1 DANGER: Indicates a hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

4.10.2 WARNING: Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

5.2.1 Safety alert symbol

The safety alert symbol may be used as specified in this standard to identify safety messages. The safety alert symbol shall not be used to identify information other than safety messages.

5.2.1.1 Using the safety alert symbol with signal words

When used with a signal word, the safety alert symbol shall precede the signal word. The base of the safety alert symbol shall be on the same horizontal level as the base of the letters of the signal word. The height of the safety alert symbol shall equal or exceed the signal word letter height.

5.2.2 Safety symbols

Safety symbols may be used to clarify, supplement, or substitute for a portion or all of a safety message. A symbol may only be used to substitute for a portion or all of a safety message if the symbol has been demonstrated to be satisfactorily comprehended (e.g., Annex B of ANSI Z535.3-2011) or there is a means (e.g., instructions, training materials, or manuals) to inform the viewer of the symbol's meaning.

5.2.2.1 Conveyed message

The conveyed message of a safety symbol should describe the type of hazard, the potential consequences of the hazard, or the evasive or avoidance actions to be taken. When used with a safety message, the safety symbol shall be compatible with the word message(s).

5.2.3 Graphics other than safety symbols

Graphics other than safety symbols (e.g., pictures, photographs, illustrations, charts, or graphs) may be used to clarify, supplement, or substitute for a portion of a safety message. Use of graphics other than safety symbols may include:

a. identifying parts referred to by hazard or avoidance information;

b. illustrating actions recommended by avoidance information;

c, providing pictures of hazardous conditions to assist the user in identifying these conditions;

d. showing the principle of operation of a safety device; or

e. presenting quantitative information in graphs or charts.

NOTE—ANSI Z535.3–2011 does not provide guidance regarding the design of graphics other than safety symbols.

5.3 Color

Safety messages and property damage messages in collateral materials may be presented in black and white, grayscale, or color independent of the number of colors used for other information in a document. If safety colors are used for safety messages, they should conform to ANSI Z535.1–2011.

5.3.1 Signal word panel

If colors are used in the signal word panel, the colors specified in Sections 5.3.1.1.1 through 5.3.1.1.4 should be used. If a document is printed with a limited number of colors or in black and white, the color used for the text of the safety messages may be used in the signal word panel.

5.3.1.1 Signal word

5.3.1.1.1 DANGER

When used in a signal word panel, the signal word "DANGER" should be in white letters on a safety red background.

5.3.1.1.2 WARNING

When used in a signal word panel, the signal word "WARNING" should be in black letters on a safety orange background.

5.3.1.1.3 CAUTION

When used in a signal word panel, the signal word “CAUTION” should be in black letters on a safety yellow background.

5.3.1.1.4 NOTICE

When used in a signal word panel, the signal word “NOTICE” should be in italicized white letters on a safety blue background.

5.3.1.2 Safety alert symbol

When used with a signal word, the solid triangle portion of the safety alert symbol shall be the same color as the signal word lettering and the exclamation mark portion shall be the same color as the signal word background. As an alternative, the safety alert symbol may consist of a black triangle band and black exclamation mark on a safety yellow triangle (see Figure 1).

When used without a signal word, the solid triangle portion shall be the same color as the safety message text and the exclamation mark portion shall be the same color as the background. As an alternative, the safety alert symbol may consist of a black triangle band and black exclamation mark on a safety yellow triangle (see Figure 1).

5.3.2 Safety message

The safety message should be printed in black text on a white background.

5.3.3 Other standards

Other colors may be used for compliance with other standards or regulations (see Section 3.2).

5.3.4 Other colors

When the text is a color other than black or the background is a color other than white throughout a document or part of a document, the safety message may be printed with the same text and background color as the rest of the document. In such cases, the selected text color should contrast with the background color and allow the message to be read by a user with normal vision under expected reading conditions.

When appropriate safety colors are not used for signal word panels, the signal word panels may be printed using the text and background colors used throughout the document or part of the document. In such cases, the selected signal word color should contrast with the background color and allow the message to be read by a user with normal vision under expected reading conditions.

5.4 Type style and size

5.4.1 Signal words

Signal words shall be in sans serif letters in uppercase only. The signal word “NOTICE” should be italicized. The type size for the signal word shall be at least as large as the type size for the associated safety message.

5.4.2 Safety message text

Safety message text shall be of a size that enables a person with normal vision, including corrected vision, to read it at a normal reading distance under expected reading conditions. The type size should be no smaller than the majority of text in the document or the non-safety text (other than headings) immediately surrounding it, whichever is greater. Safety message text should employ a combination of upper- and lowercase letters. Uppercase-only lettering may be used for emphasis of individual words or short phrases within a safety message.

6 Supplemental directives

6.1 Purpose

A supplemental directive in a document may serve several purposes, including: