MIL-STD-104C
31 OCT 1986

SUPERSEDING
MIL-STD-104B
31 DEC 1970

MILITARY STANDARD

LIMITS FOR ELECTRICAL INSULATION COLOR

AMSC N/A FSC 6145

DEPARTMENT OF DEFENSE
WASHINGTON, DC 20301

Limits for Electrical Insulation Color

MIL-STD-104C

1. This Military Standard is mandatory for use by all Departments and Agencies of the Department of Defense.

2. Recommended corrections, additions or deletions should be addressed to the Commander, Naval Air Systems Command (AIR-52021), Department of the Navy, Washington, DC 20360.

CONTENTS

1. SCOPE

1.1 Scope. This standard establishes definite limits for electrical insulation colors as used on wire and cable insulations. The limits of a specified color define the extremes established for that color. The nominal defines the hue, lightness and saturation (chroma) considered most desirable for the specified color.

1.2 Classification. Colors shall be in two classes as specified. When the class is not specified, either class may be used.

Class 1: Colors in this class are for the most part, highly saturated, bright high-gloss colors for plastic and other insulating materials where the characteristics of the material permit the use of these colors.

Class 2: Colors in this class are characteristically less saturated, low-gloss colors, for fabric, rubber and other insulations for which Class 1 colors are not practicable.

2. REFERENCED DOCUMENTS

2.1 Other publications. The following document forms a part of this standard to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

Electronic Industries Association Standard

RS-359 dated August 1968	EIA Standard Colors for Color Identification and Coding

(Copies of EIA Standard RS-359 may be obtained from Electronic Industries Association, Engineering Department, 2001 Eye Street, N.W., Washington, DC 20006.)

3. DEFINITIONS

3.1 Munsell system of color notation. The three attributes of color in the Munsell system are defined as follows:

3.1.1 Hue. The hue of a color is the attribute describable as red, yellow, green, blue or purple, or as intermediate between some adjacent pair of these. The hue notation indicates the relation of the color to these hues.

3.1.2 Value. The value of a color is its lightness. The value notation is a measure of the lightness ranging from 0 for black to 10 for white.

3.1.3 Chroma. The chroma of a color is the strength of the color or its departure from neutral. The chroma notation is a measure of the departure from neutral.

3.1.4 Munsell notation. A color is recorded in Munsell notation in the form H V/C, where H is the hue notation, V is the value notation and C is the notation for chroma. For example, the Class 2 light limit brown card (Table I) has the following Munsell notation: 3.5 YR 3.2/2.3, which indicates that the color is 3.5 yellow red in hue, 3.2 in value, and 2.3 in chroma.

3.1.5 Neutral. Neutral color (N) is defined in the Munsell system as color having neither hue nor chroma. White, gray and black are neutral colors. The principal attribute of white, gray and black is value. It will be noted that the limit chips for these colors have a hue notation and also a low chroma notation, indicating a slight but measurable hue (see 5.2.2).

4. GENERAL REQUIREMENTS (Not applicable)

5. DETAIL REQUIREMENTS

5.1 Class 1 colors. Class 1 colors shall be colors as defined by EIA Standard RS-359.

* 5.2 Class 2 colors. Class 2 colors shall be colors as defined by the limit cards of Appendix A of this standard and by the CIE (Commission Internationale de l'Eclairage) data and Munsell notations of Table I; also by paragraphs 5.2.1 through 5.2.2.3 of this standard.

* 5.2.1 Limits for Class 2 colors (white, black and gray excepted). Colors shall be deemed as meeting the applicable requirements of this standard for Class 2 colors (white, black and gray excepted) if, by direct comparison with the limit cards of Appendix A, direct comparison with Munsell charts, or spectrophotometry, all the following requirements are met (Munsell notations for all Appendix A limit cards are listed in Table I):

5.2.1.1 Hue. The hue shall be either intermediate to those of the applicable light and dark limit cards or within one (1.0) Munsell hue step of them.

5.2.1.2 Value. The value shall be either intermediate to those of the applicable light and dark limit cards or within 0.3 Munsell value step of one or the other of them.

5.2.1.3 Chroma. The chroma shall be equal to or greater than that of at least one of the applicable light or dark limit cards.

5.2.2 Limits for white, black and gray, Class 2 colors.

5.2.2.1 White. White, Class 2, shall be any color with Munsell value not less than, and Munsell chroma not greater than, the dark limit white card. It is desirable for white to have the highest possible value or reflectance and to have no significant hue. Clear (unpigmented) insulation shall not be considered as being white in color.

5.2.2.2 Black. Black, Class 2, shall be any color with Munsell value not greater than 2.8 (reflectance not greater than 5.7) and Munsell chroma not greater than 0.5.

* 5.2.2.3 Gray. Gray, Class 2, shall be any color intermediate to the light and dark limit gray cards of Appendix A.

6. NOTES

6.1 Intended use.

6.1.1 Class 1 colors. Class 1 colors are applicable to all insulation materials which will accept bright, highly saturated (high chroma) pigments. In general, plastic insulations intended for use where exposure to direct sunlight is infrequent can be furnished in Class 1 colors. Wherever possible, Class 1 colors are preferred to Class 2 colors and should be specified. Violet may be used where purple is specified.

6.1.2 Class 2 colors. Class 2 colors are applicable to all insulation materials which will not accept Class 1 colors particularly where color permanence is a factor. In general, fabric and rubber materials may require use of Class 2 colors, although Class 1 colors should be specified if their use is practicable.

* 6.2 Appendix A. Appendix A to this standard consists of a series of light and dark limit color cards which may be used for making direct comparison with the insulation. Pertinent CIE data and Munsell notations are printed on the reverse side of each card.

* 6.3 Subject term (key word) listing.

Color
Electrical insulation color
Insulation color

* 6.4 Changes from previous issue. The margins of this standard are marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in the notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Navy - AS
Army - CR
Air Force - 17

Preparing activity:
Navy - AS
(Project No. 6145-1077)

Review activities:
Navy - EC, YD
Army - MI, WC
Air Force - 17
Defense Supply Agency - IS
National Security Agency

User activities:
Navy - MC, OS, SH
Army - AT, AV
Air Force

Review/user information is current as of the date of this document. For future coordination of changes to this document, draft circulation should be based on the information in the current Federal Supply Classification Listing of DOD Standardization Documents.

TABLE I. Color notation chart - Class 2 color cards (see Note 1).

C.I.E.					
Color limit card Sup. #1 MIL-STD-104 (See Note 2)		Coordinates		Daylight reflectance, percent	Munsell H V/C
		X	Y		
Brown	Light	.378	.342	7.4	3.5YR 3.2/2.3
	Nominal	.435	.355	6.6	2.5YR 3.0/4.0
	Dark	.364	.337	6.1	3.0YR 2.9/1.8
Red	Light	.530	.313	11.2	5.0R 3.9/11.2
	Nominal	.549	.302	6.6	5.0R 3.0/10.0
	Dark	.457	.299	6.2	3.0R 2.9/6.7
Orange	Light	.542	.384	25.7	1.5YR 5.6/12.7
	Nominal	.577	.367	19.8	10.0R 5.0/14.0
	Dark	.575	.363	19.2	10.0R 4.9/13.6
Yellow	Light	.415	.419	62.9	2.5Y 8.2/7.6
	Nominal	.468	.459	59.1	2.5Y 8.0/12.0
	Dark	.477	.444	50.5	0.5Y 7.5/11.5
Green	Light	.339	.447	39.5	7.5GY 6.7/7.2
	Nominal	.308	.495	30.1	10.0GY 6.0/10.0
	Dark	.264	.477	11.2	2.0G 3.9/8.0
Blue	Light	.238	.275	20.1	6.5B 5.0/4.8
	Nominal	.225	.261	19.8	7.5B 5.0/6.0
	Dark	.228	.252	10.9	10.0B 3.8/4.8
Purple	Light	.307	.247	11.9	7.5P 4.0/5.5
	Nominal	.278	.171	6.6	5.0P 3.0/10.0
	Dark	.265	.225	5.4	0.5P 2.7/4.2
Gray	Light	.317	.330	31.8	3.5GY 6.2/0.7
	Nominal	.310	.319	24.8	N 5.5/0.0
	Dark	.305	.311	18.0	5.0PB 4.8/0.3
White	Dark	.368	.378	59.3	3.5Y 8.0/4.0

NOTES:

1. The light and dark limit color notations of this table define the cards of Appendix A. See 5.2.1 through 5.2.2.3 for applicable extensions to these limits.

*2. Appendix A contains light and dark limit cards only. Munsell color chips of proper notation may be used for nominals and for applicable color limits beyond the range of the Supplement 1 cards.

U.S. GOVERNMENT PRINTING OFFICE: 1986 - 704-036/45996

For a copy of MIL-STD-104C, Appendix “A” dated 31 October 1986 titled “ Limits for Electrical Insulation Color” please fax a request to 215-697-9398 and provide your mailing address below.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-STD-104C	LIMITS FOR ELECTRICAL INSULATION COLOR

3a. NAME OF SUBMITTING ORGANIZATION

b. ADDRESS *(Street, City, State, ZIP Code)*

4. TYPE OF ORGANIZATION *(Mark one)*

- ☐ VENDOR
- ☐ USER
- ☐ MANUFACTURER
- ☐ OTHER *(Specify)*: _____

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

DD FORM 82 MAR 1426 PREVIOUS EDITION IS OBSOLETE.

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)