



AEROSPACE MATERIAL SPECIFICATION

AMS-STD-595®**REV. A**Issued 2015-10
Revised 2017-02

Superseding AMS-STD-595

(R) Colors Used in Government Procurement

RATIONALE

This revision is proposed to correct references to the FED-STD-595 document introduced during the conversion to AMS-STD-595. Additionally, the revision provides updated color reference media information as well as replaces tristimulus color values with CIE L*a*b* color values. Forty-two new colors have also been added to the standard.

NOTICE

The initial release of this document replaced FED-STD-595C. Colors identified by the original standard remain unchanged.

The original federal standard was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) rules and regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE committee level, and (b) the use of the existing government specification or standard format.

1. SCOPE

This standard defines a color index system used by, but not limited to, Government activities in a format suitable for color identification, color selection, color matching, and quality control inspection. It also describes the designation and use of color media that is available to conduct these activities. Use of the color index referenced in this standard is intended to promote standardization and consistency in the color of items produced for Government use. Color media is described as follows:

- a. Color Chip Representation, Fan Deck: Suitable for color identification and selection.
- b. Color Chip Representation, Color Book: Suitable for color identification and selection.
- c. Precise Color Matching, Individual Color Chips: Suitable for color matching and quality control inspection purposes.
- d. Precise Color Matching, Set of Color Chips: Suitable for color matching and quality control inspection purposes.

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2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 ASTM Publications

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

ASTM D523 Standard Test Method for Specular Gloss

ASTM D1729 Standard Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials

ASTM D2244 Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

ASTM E308 Standard Practice for Computing the Colors of Objects by Using the CIE System

2.2 CIE Publications

Available from CIE Central Bureau, Babenbergerstraße 9/9A, 1010 Vienna, Austria, Tel: +43 1 714 31 87, www.cie.co.at.

CIE 15:2004 Colorimetry, 3rd edition

3. GENERAL REQUIREMENTS

- a. Color Identification: Each color presented in this standard is identified by a five-digit code. The color of items produced for Government use shall be referenced by the applicable five-digit code.
- b. Color Reference System: There are nine color groups and three gloss designations in the current color reference system.
 1. The first number corresponds to the gloss level as defined by the gloss unit range (see Table 1).
 2. The second number corresponds to the color group chosen for the color (see Table 2).
 3. The last three numbers correspond to an order within the color group loosely based on increasing lightness with increasing number.

Table 1 - First digit (60° specular gloss, ASTM D523)

First Digit	Finish	Gloss Units	
		Minimum	Maximum
1	Gloss	80	--
2	Semi-gloss	30	45
3	Flat	--	6

Table 2 - Second digit

Second Digit	Color Groups
0	Brown
1	Red
2	Orange
3	Yellow
4	Green
5	Blue
6	Gray
7	Misc (Black, White, Gold, Silver, Violet)
8	Fluorescent

- c. **Color Matching:** Color chips shall be used for color matching and control of items produced for Government use. Color matching shall be accomplished by comparing CIE L*a*b* color coordinates obtained from spectrophotometric analysis of the item produced for Government use and the applicable color chip. ASTM D2244 defines the procedures for calculation of color tolerances and color differences when using instrumentally measured color coordinates. Unless otherwise specified or designated by the contracting officer, the color chips used for the color matching shall be the latest in effect by date of contract.

Neither the Fan Decks nor the Color Book shall be used for color matching. Their intended purpose is solely as an aid during color identification and selection activities.

NOTE: Although this standard does not address visual color matching, it is recognized that this method of color matching may be utilized by some entities. In that case, it is important to understand metamerism effects. Colors that visually match in lights of certain spectral compositions but not in others are said to be metamerism. In order to overcome metamerism and determine correct visual color match, the light source, condition of viewing and specular reflectance must be considered. When using color media for visual color matching, it is recommended that light sources as specified in ASTM D1729 be used to mitigate metamerism.

- d. **Gloss Matching:** The gloss of items produced for Government use shall match the intended gloss of the applicable color. ASTM D523 defines the procedures for calculation of specular gloss, referenced in Table 1 and Appendix A for a 60° glossmeter geometry.

NOTE: Due to the substrate and colorants used in the production of the Gloss 3 x 5 inch color chips, some colors may not measure greater than or equal to 80 gloss units when gloss is tested on the chips. However, precise color matching will not be affected.

NOTE: The gloss ranges in Table 1 may be considered arbitrary. Specific levels of gloss other than these standard levels shall be separately specified in the procurement documents.

- e. **Color Chips Authorized for Use:**

1. After the publication of this standard, only color chips marked AMS-STD-595 shall be used as reference material for this standard.
2. Color chips which are soiled, stained, faded, or otherwise damaged due to improper handling, storage, or exposure to light or chemicals shall not be used.

NOTE: All color chips will change with time, with some colors changing more than others. Color change can be minimized by observing the following recommendations.

(a) Store the color chips in a cool dark place.

(b) Avoid exposure of the color chips to direct or scattered UV light or chemicals.

- (c) Minimize exposure of the color chips to light from any source.
 - (d) Keep the color chips covered when not in use.
 - (e) Do not touch the face of the color chips.
- f. Color Chip Reproduction: Color chips shall not be reproduced without the authorization of SAE International. Reproduction of color chips from any source other than the master standard is not authorized. SAE International shall approve all color matches made when the color chips are reproduced.

4. PROCUREMENT INFORMATION

- a. The following items are available to comply with the color media format requirements established in Section 1 of this standard.
1. Fan Deck: Fan Deck consists of individual leaves bound with one screw post, each leaf typically containing ten 0.625 x 2 inch color chip representations arranged in numerical order. A numeric index and two-piece cover are included. Each Fan Deck is housed in a one-piece protective sleeve.

Part Number: EA-FANDECK

2. Color Book: Color Book consists of spiral-bound 8.5 x 11 inch pages containing 0.5 x 1 inch color chip representations compiled by color group and gloss designation.

NOTE: There is no current Color Book Part Number as these have been temporarily discontinued and are not offered for this revision.

3. Individual Color Chips: Individual 3 x 5 inch color chips for each AMS-STD-595A color are supplied in a protective envelope. The back of each chip is labeled with the applicable color number, date of chip, and "AMS-STD-595A"

Part Number: EA-XXXXX (where XXXXX represents specific color number)

4. Set of Color Chips: A boxed set containing one 3 x 5 inch color chip in its protective envelope for each AMS-STD-595A color. Set contains 692 color chips.

Part Number: EA-CHIPSET

- b. Contact SAE International to order color media:

Website: store.sae.org/ea/

Telephone: 877-606-7323 (inside USA and Canada)
+1 724-776-4970 (outside USA)

Mail: SAE Customer Service
400 Commonwealth Drive
Warrendale, PA 15096-0001

5. NOTES

- a. Color Cross Reference, Safety, Highway and Camouflage Colors: Table 3 lists colors that meet the special requirements for Safety, Highway and Camouflage colors.

Table 3 - Safety, highway and camouflage cross reference

Safety Colors, (OSHA)	Chip Number	Highway Colors, (DOT)	Chip Number	Camouflage Colors	Chip Number
Red	11120	Brown	10055	Green 383	34094
	11105	Red	11086	Brown 383	30051
	11140		11105	Black	37030
Orange	12300	Orange	12243	Tan 686A	33446
	12246	Yellow	13507	Dark Green	34082
Yellow	13591		13538	Field Drab	33105
	13655	Green	14066	Earth Yellow	33245
Green	14120		14109	Sand	33303
	14260	Blue	15065	Aircraft Green	34031
Blue	15092		15090	Aircraft Gray	36300
	15102	School Bus Yellow	13415	Dark Sandstone	33510
Purple	17155			Interior Aircraft Black	37031
	17142				
International Orange	12197				

NOTE: The chips for camouflage colors shall be used for general color matching purposes only. The specifications for camouflage coatings contain requirements for infrared reflectance which must be met in addition to color. The color cards (chips) for the camouflage colors will contain pigments chosen for their suitability and compatibility with the color card coating and, therefore, have different infrared reflectance characteristics than those required for camouflage coatings. Merely matching the color chip for color will not be sufficient to assure product acceptance by the contracting activity. For further information, contact for camouflage colors only: U.S. Army Research Laboratory, CARC Commodity Management, ATTN: AMSRD-ARL-WM-MC, Aberdeen Proving Ground, MD 21005-5069.

- b. International Standardization Agreement: Several colors listed in this standard are the subject of international standardization agreement, MAS Army 440, 7 December 1987, NATO STANAG 2321, Edition 4. When there is a change, revision, or cancellation of this standard which will affect or violate the international agreement concerned, the preparing activity will take appropriate reconciliatory action through international standardization channels including departmental standardization office, if required. The following colors are covered by the above agreement:

1. Silver/aluminum 17178
2. Brown 30117 or 30140
3. Red 31136
4. Light Red 31158
5. Yellow 33538
6. Light Green 34558 or 34449

7. Dark Green 34108
 8. Light Blue 35109
 9. Gray 36231
 10. Black 37038
 11. Violet 37100
 12. White 37875
- c. Digital Coordinate Data: CIE L*a*b* coordinate data, as defined in CIE 15:2004 and computed per ASTM E308, are provided as a reference in this standard to supplement the primary color chip reference. The coordinate data, listed in Appendix A, was generated using the CIE standard illuminant D₆₅.

This data is based on measurements of 2008 and 2010 Color Proofs provided by ChromaSource, Inc. (2433 S 600 E, Columbia City, IN 46275, 260-420-3000). These Color Proofs were the basis of the five-digit code colors presented in FED-STD-595C. ChromaSource maintained all related Color Proofs in a dark and cool environment to ensure minimal to no degradation in color or color drift. The digital coordinate data was obtained by directly scanning the Color Proofs using the Hunter UltraScan VIS, Diffuse Sphere 8 degree geometry spectrophotometer, 10 degree observer (Hunter Associates Laboratory, Inc. 11491 Sunset Hills Road, Reston, VA 20190-5280, 703-471-6870).

Use of a different color measurement device or the same device with different settings may result in significantly different coordinate data values.

- e. New colors added to AMS-STD-595 Rev. A at the request of the Royal Canadian Air Force (RCAF) and the U.S. Army/Marine Corp: RCAF and the U.S. Army/Marine Corp provided color samples to SAE. Color Proofs were developed and measured to obtain the CIE L*a*b* digital coordinate data. The colors listed in Table 4 (RCAF) and Table 5 (U.S. Army and Marine Corp) have been added to the Master Color List in Appendix A.

Table 4 - New RCAF colors

RCAF Color ID	Color	Chip Number
Snowbird Red I-4147	Red	11330
Snowbird Blue I-6256	Blue	15051
Snowbird White I-1310	White	17930
Blue 25044	Blue	25044

Table 5 - New U.S. Army and Marine Corp colors

U.S. Army/Marine Corp Color ID	Color	Chip Number
561	Bark Brown	30037
530	Dark Brown	30063
529	Brown	30098
450	Tan	30169
M-1	Khaki	30267
525	Tan	30373
453	Maroon	31100
2501/2502/2510	Scarlet	31348
558	Gold	33654
297	Rifle Green	34057
2209	Green	34065
	Ranger Green	34076
2247/2248	OD green	34078
2212	Green	34080
2243	Green	34085
523	Belleau Wood Green	34087
528	Dark Green	34101
562	Moss Green	34150
526	Pale Green	34202
560	Light Sage	34203
527	Olive	34256
2307	Marine Dark Blue	35039
2312	Marine Dark Blue	35040
450	Blue	35041
3378	Blue	35043
2319	Sky Blue	35046
451	Blue	35047
548	Slate Grey	36007
2246	Pewter	36356
477	Black	37029
557	Black	37032
458	Black	37033
3202	Black	37034
2607	Black	37039
559	Dark Cream	37490
524	Cream	37500
521	White	37970
2414	White	37971