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TIA STANDARD

Optical Fiber Cable Color Coding

TIA-598-D
(Revision of TIA-598-C)

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Optical Fiber Cable Color Coding

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FOREWORD

(This foreword is not part of this Standard.)

This Standard provides all necessary information for color coding optical fiber cables in a uniform manner.

This Standard was formulated as TIA Standards Proposal number ANSI/TIA-PN-598-D (old PN SP-3-3555-RV3-A) under the cognizance of TIA TR-42.12, Subcommittee on Optical Fibers and Cables.

This issue replaces the previous issue of TIA Standard 598, TIA-598-C, dated 2005. Changes include the following:

- Addition of text from EIA-359-A specifying the lighting conditions for visual assessment of color standards.
- Updating the jacket color coding scheme for indoor cable to current fiber specifications and adding a new fiber type, aligning this standard with TIA-568-C.3.
- Changed “premises” to “indoor”, throughout, to harmonize terminology with International standards.

This Standard contains six annexes. Annex A is normative and is considered part of this Standard. Annexes B, C, D, E, and F are informative and are not considered part of this Standard.

Key words: fiber identification, color identification, identification scheme

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Optical Fiber Cable Color Coding

1 Scope

This standard defines the recommended identification scheme or system for individual fibers, fiber units, and groups of fiber units within a cable structure. The methods contained herein may be used to identify and locate specific fibers for the purpose of connection, termination, or testing within a communication system or for the topography of long haul, feeder route, subscriber, or distribution applications for both indoor and outside plant use.

This standard also defines the optical fiber type identification scheme for color coding or marking jackets for military cables or indoor cables. Cables with colored jackets are typically used only in intrabuilding applications and must be listed to a level of fire resistance specific to their use. The jacket materials used can be colored for identification purposes.

Conversely, most cables deployed outdoors must incorporate additives in the jacket material to be able to withstand the damaging effects of solar radiation over their designed operating lifetime. Such products typically contain carbon black material to provide the requisite level of protection, which precludes the use of any jacket color other than black. Although color-compatible materials designed to resist solar radiation are available for outdoor use, and other means for color-coding black jackets are possible (i.e., colored striping), the use of such materials and methods are beyond the scope of this standard.

2 Normative references

The following standards contain provisions which, through references in this text, constitute provisions of this Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. ANSI and TIA maintain registers of currently valid national standards published by them.

ANSI/EIA-359-A-1988 *EIA Standard Colors for Color Identification and Coding*

ANSI/TIA-4920000-B-2002 *Generic Specification for Optical Fibers*

ANSI/TIA-492A000-A-2002	*Sectional Specification for Class Ia Graded-Index Multimode Optical Fibers*
ANSI/TIA-492AAAA-B-2009	*Detail specification for 62.5-µm core diameter/125-µm cladding diameter class Ia graded-index multimode optical fibers*
ANSI/TIA-492AAAB-A-2009	*Detail specification for 50-µm core diameter/125-µm cladding diameter class Ia graded-index multimode optical fibers*
ANSI/TIA-492AAAC-B-2009	*Detail specification for 850-nm laser-optimized, 50-µm core diameter/125-µm cladding diameter class Ia graded-index multimode optical fibers*
TIA-492AAAD-2009	*Detail Specification for 850-nm Laser-Optimized, 50-µm Core Diameter/125-µm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers Suitable for Manufacturing OM4 Cabled Optical Fiber*
ANSI/TIA-492C000-2002	*Sectional specification for class IVa dispersion-unshifted single-mode optical fibers*
TIA-492CAAA-1998	*Detailed Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers*
TIA-492CAAB-2000	*Detailed Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak*
ANSI/TIA-492EC000-1996	*Sectional specification for class IVd non-zero dispersion single-mode optical fibers for the 1550 nm window*
ASTM D 1535-2001	*Standard Practice for Specifying Color by the Munsell System*
Munsell Color Charts	*Munsell Color Charts for Color Coding* (Visual Standards for ANSI/EIA-359-A)
ANSI/NFPA 70-2011	*National Electrical Code*
IEC 60757-1983	*Codes for Designation of Colors*
IEC 60304-1982	*Standard colours for insulation for low-frequency cables and wires*

3 Fiber, unit, and group color coding

Each individual fiber within a fiber optic cable shall be uniquely identifiable in terms of its color, unit, group, and/or position. The following scheme applies to cables in which the fibers are physically separated. For cables in which individual fibers are identified by fixed positional configuration (e.g., some ribbon cable, slotted core), this color scheme is preferred but is not mandatory.

3.1 Individual fibers

All fibers shall be discernibly and uniquely color coded using the preferred method in accordance with one of the alternatives given in Table 1, or the surrogate method given in annex C (informative), Table C-1[1)]. The identification may be by coloring, by printed legend, by printed block coding, or by other unique methods meeting the intent of this Paragraph and as agreed upon by the manufacturer and the user. If a printed legend is used in lieu of actual color coding for identification, the legend shall consist of the numerical position number or the color abbreviation, or both, as listed in Table 1. If printed block coding is used, it shall consist of printed blocks and bar or hachure marks corresponding to the numerical position. A sample scheme is illustrated in Table 2; this marking scheme may be extended as necessary.

3.2 Fiber units

Units are primary groupings of individual fibers. Examples of units include, but are not limited to: buffer tubes which contain individual fibers; multi-fiber ribbons; fibers bundled by threads or tape; and the slots of slotted-core cables, when the fibers within each slot are not otherwise grouped or connected. When a number of fibers (e.g., 6, 12, 18, or 24) form a unit, the unit shall be uniquely identified in accordance with one of the alternatives given in Table 1 or Table C-1 as described in 3.1.

3.3 Fiber groups

Groups are collections of units. Examples of groups include, but are not limited to: buffer tubes which contain ribbons, bundled fibers, or other fiber units; the slots of slotted-core cables, when the fibers in each slot are grouped in units such as ribbons; and ribbons which are assembled from two or more smaller ribbons. When a number of units form a group, the group may be uniquely identified in accordance with one of the alternatives given in Table 1 or Table C-1[1)] as described in 3.1.

1) Table C-1 uses the IEC color abbreviations.

Table 1 - Individual fiber, unit, and group identification

Position #	Base color/tracer per TIA/EIA	Abbreviation/print legend
1	Blue	1 or BL or 1-BL
2	Orange	2 or OR or 2-OR
3	Green	3 or GR or 3-GR
4	Brown	4 or BR or 4-BR
5	Slate	5 or SL or 5-SL
6	White	6 or WH or 6-WH
7	Red	7 or RD or 7-RD
8	Black	8 or BK or 8-BK
9	Yellow	9 or YL or 9-YL
10	Violet	10 or VI or 10-VI
11	Rose	11 or RS or 11-RS
12	Aqua	12 or AQ or 12-AQ
13	Blue with Black Tracer	13 or D/BL or 13-D/BL[2)]
14	Orange with Black Tracer	14 or D/OR or 14-D/OR
15	Green with Black Tracer	15 or D/GR or 15-D/GR
16	Brown with Black Tracer	16 or D/BR or 16-D/BR
17	Slate with Black Tracer	17 or D/SL or 17-D/SL
18	White with Black Tracer	18 or D/WH or 18-D/WH
19	Red with Black Tracer	19 or D/RD or 19-D/RD
20	Black with White Tracer[1)]	20 or D/BK or 20-D/BK
21	Yellow with Black Tracer	21 or D/YL or 21-D/YL
22	Violet with Black Tracer	22 or D/VI or 22-D/VI
23	Rose with Black Tracer	23 or D/RS or 23-D/RS
24	Aqua with Black Tracer	24 or D/AQ or 24-D/AQ
25	Blue with Double Black Tracer[3)]	25 or DD/BL or 25-DD/BL[2)]
26	Orange with Double Black Tracer	26 or DD/OR or 26-DD/OR
27	Green with Double Black Tracer	27 or DD/GR or 27-DD/GR
28	Brown with Double Black Tracer	28 or DD/BR or 28-DD/BR
29	Slate with Double Black Tracer	29 or DD/SL or 29-DD/SL
30	White with Double Black Tracer	30 or DD/WH or 30-DD/WH
31	Red with Double Black Tracer	31 or DD/RD or 31-DD/RD
32	Black with Double White Tracer[1)]	32 or DD/BK or 32-DD/BK
33	Yellow with Double Black Tracer	33 or DD/YL or 33-DD/YL
34	Violet with Double Black Tracer	34 or DD/VI or 34-DD/VI
35	Rose with Double Black Tracer	35 or DD/RS or 35-DD/RS
36	Aqua with Double Black Tracer	36 or DD/AQ or 36-DD/AQ
37 – 48	See Note 4.	See Note 4.
Table Notes follow.		

Table Notes for Table 1
1) Other discernable tracer colors may be used as agreed to by the manufacturer and the user. 2) “D/” denotes a dashed mark or tracer per 3.6. That is, D/BL is Dash/Blue, meaning Blue with a tracer. “DD/” denotes a double-dash mark or tracer per 3.6. That is, DD/BL is Double Dash/Blue, meaning Blue with a double tracer. 3) Positions 25 through 36 shall allow, as an alternative to double-dash tracers, a single red stripe except for red which is striped yellow. 4) For positions 37 through 48, use the same 12 base colors but allow a single green stripe, except for green which shall use an orange stripe. As an alternative, a triple black dash/tracer mark may be used, except for black, which shall use a triple white dash/tracer mark.

Table 2 - Sample identification markings

Position	Sample marking[1)]
1	
…	…
6	
…	…
12	
…	…
22	
…	…
32	
1) Each block denotes “5” and each bar denotes “1.”	

3.4 Simplex and duplex cable designs

The identification of fibers, units, and groups shall comply with one or more of the alternatives given in Table 1 or Table C-1 as described in 3.1, except in the following situations.

3.4.1 In cables or units which contain only a single fiber (simplex), that fiber may remain uncolored or “Natural” in color.

3.4.2 In cables or units which contain two fibers (duplex), the fibers must be discernible from each other. Acceptable color coding schemes include Blue and Orange, Blue and Natural, or Natural and Natural with tracer.

3.5 Binder Tapes

When units and groups (3.2 and 3.3) are identified by means of binder tapes, ribbons, threads, etc., the colors of such identifiers shall be unique and discernible and shall conform as closely as possible to the requirements of clause 5.

3.5.1 For binder tapes, ribbons, threads, etc., for units or groups numbers 13 to 24, use two binders: one to match the base color and one to match the tracer color. Alternatively, use a single binder that incorporates both the base color and a single tracer color. For positions 18 (D/WH) and 20 (D/BK), or others such as 21 (D/YL) and 20 (D/BK) if a Yellow tracer is used, for example, use two binders to match the base color and one binder to match the tracer color. Alternatively, use two identical single binders each incorporating both the base color and single tracer coloring.

3.5.2 For binder tapes, ribbons, threads, etc., for units or groups numbers 25 to 36, use an appropriate method. Examples are marked tapes, multiple binders, etc. If multiple binders are chosen, use four binders: two each to match the base and tracer colors; alternatively use two binders to match the base color each dashed with the tracer color.

3.6 Tracers

Unless otherwise specified, tracer colors on individual fibers or tubes may be continuous (unbroken) or intermittent (dashed) longitudinal or spiral lines, continuous or intermittent ring stripes (sometimes called band marking), or hachure marks (see Figure 1) in accordance with 3.6.1, 3.6.2, or 3.6.3, as appropriate. All dimensions noted in this subclause shall be considered to be nominal.

3.6.1 Continuous or intermittent longitudinal and spiral tracers

3.6.1.1 Continuous (unbroken) or intermittent (dashed) longitudinal or spiral stripe tracers are not permitted for coated fibers having an outer diameter of 300 µm or less.[2)] Continuous or intermittent longitudinal or spiral stripe tracers are permitted for larger coated fibers or tubes.

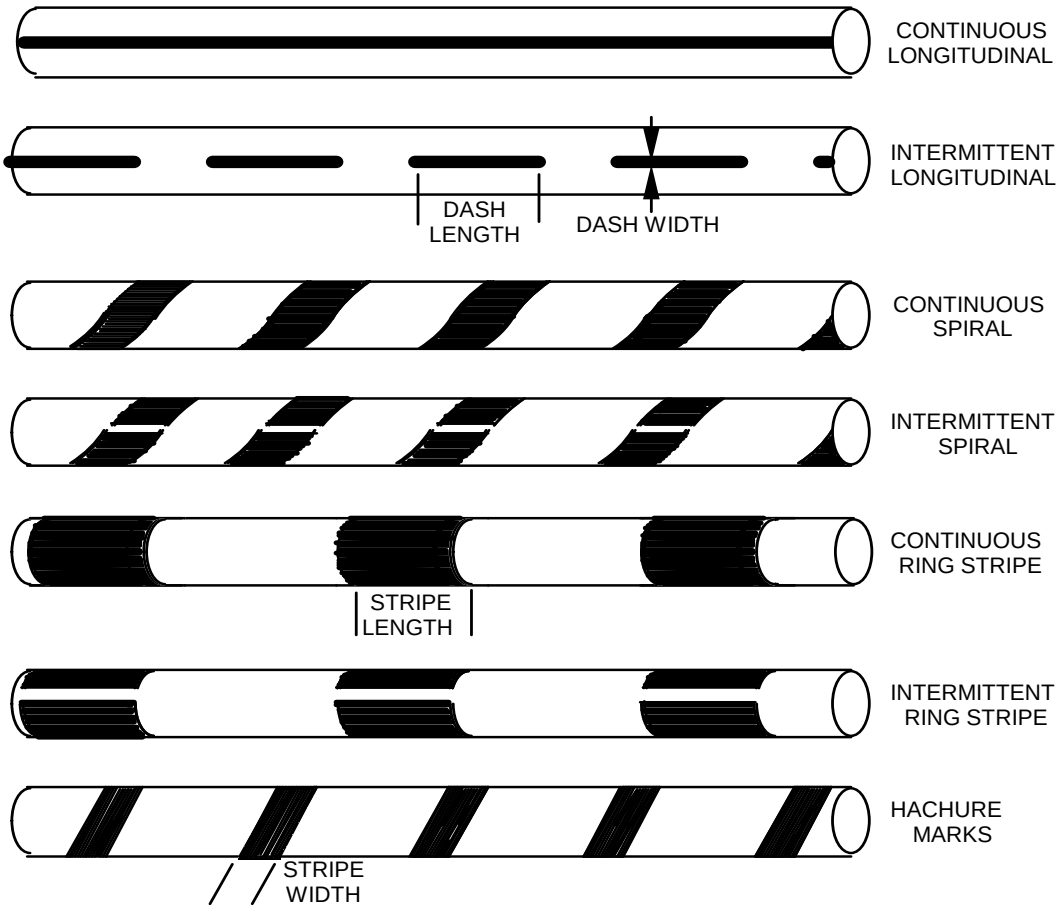
3.6.1.2 The recommended minimum circumferential coverage of each longitudinal tracer is the lesser of 1 mm or 30% of the circumference of the fiber or tube being striped. Other coverage/spacing variations are acceptable so long as each fiber is uniquely identifiable.

3.6.1.3 For intermittent longitudinal tracers on fibers, the ratio of base color length to the tracer length shall be not less than 2:1.

2) The rationale for this is that fibers of this size are too small for discernible longitudinal or spiral stripe tracers.

3.6.1.4 For double longitudinal tracers, the recommended minimum circumferential coverage of the tracer pair, including the space between the tracers, is the lesser of 1.5 mm or 45% of the circumference of the fiber or tube being striped. The length of each tracer and the space separating the two tracers should all be the consistent. If the tracers are intermittent, the requirement of 3.6.1.3 shall apply, and the locations of all dashes and breaks shall be the same for both tracers. Other coverage/spacing is acceptable so long as it provides unique identification. A double tracer may also be indicated by a single longitudinal tracer pattern with double intermittences.

Figure 1 - Illustrations of tracer methods



3.6.1.5 For tubes with intermittent tracer marks, the distance between the starting points of individual tracer marks, or pairs of marks (whether parallel or serial), shall not exceed 160 mm.

3.6.2 Continuous or intermittent ring stripe tracers

3.6.2.1 Intermittent ring stripe tracers shall cover a minimum of 80% of the circumference of the fiber or tube being striped.

3.6.2.2 For fibers, the minimum ratio of base color to tracer color lengths shall not be less than 2:1. For double tracer rings, the ratio of base color to the overall length of a pair of rings shall be not less than 2:1. Each individual ring, and the space separating the two rings in the pair, shall be the same length.

3.6.2.3 For tubes, the ratio of base color to tracer color lengths shall be not less than 4:1. For double tracer rings, this ratio shall apply to the overall length of the pair of rings. Within this limit, the length of the tracer rings is not specified (See Figure 1), although within a pair of rings the length of each individual ring and the spacing between them shall be the same. The distance between the starting points of individual rings shall not exceed 160 mm.

3.6.3 Hachure stripe tracers

Requirements for hachure stripe tracers are the same as for ring stripe tracers (3.6.2), except that stripe widths shall be measured at right angles to the direction of the hachure, and the spacing between hachures shall be measured along the axis of the fiber or tube.

3.7 Printed legends

For structures using printed legends (e.g., individual ribbons), the legend used shall be repeated at regular intervals not to exceed 300 mm start-to-start.

4 Color coding of indoor fiber optic cable

NOTE - Optical indoor cable categories are defined in annex A (normative).

4.1 Unless otherwise specified, fibers, units, and groups within Indoor Distribution Cable shall be color coded in accordance with Table 1 and as described in 3.1 through 3.4.

4.2 Colored outer jackets or print may be used on Indoor Distribution Cable, Indoor Interconnect Cable or Interconnect Cord, or Indoor Breakout Cable to identify the classification, as in TIA-4920000, and fiber sizes, as in TIA-492A000, of the fiber.

NOTE - Cables deployed outdoors must incorporate additives in the jacket material to be able to withstand the damaging effects of solar radiation over their designed operating lifetime. Such products typically contain carbon black material to provide the requisite level of protection, which precludes the use of any jacket color other than black, and are beyond the scope of this standard.

4.2.1 When colored jackets are used to identify the type of fiber in cable containing only one fiber type, the colors shall be as indicated in Table 3. Other colors may be used providing that the print on the outer jacket identifies fiber classifications in accordance with 4.2.3. Such colors should be as agreed upon between manufacturer and user.

NOTE - Annex B (informative) may be used as a guide for other colors. Writers of Detail Specifications should note that for some Indoor Cable functional types (e.g., plenum cables), colored jacketing material may not be available. Distinctive jacket colors for other fiber types may be considered for addition to Table 3 at some future date.

Table 3 - Preferred coding scheme for indoor cable jackets

Fiber type	**Jacket color**[1)]		
	Non-military Applications[3)]	**Military Applications**	**Print Nomenclature**
Multimode (62.5/125) (TIA-492AAAA)	Orange	Slate	OM1
Multimode (50/125) (TIA-492AAAB)	Orange	Orange	OM2
Multimode (50/125) (850 nm laser-optimized) (TIA-492AAAC and TIA-492AAAD)	Aqua	---	OM3 (for TIA-492AAAC) OM4 (for TIA-492AAAD)
Multimode (100/140)	Orange	Green	100/140
Single-mode (TIA-492CAAA and TIA-492CAAB)	Yellow	Yellow	OS1 (for TIA-492CAAA) OS2 (for TIA-492CAAB)
Polarization Maintaining Single-mode	Blue	---	Undefined[2)]

1) Natural jackets with colored tracers may be used instead of solid-color jackets.
2) Because of the limited number of applications for these fibers, print nomenclature are to be agreed upon between manufacturer and end user.
3) Other colors may be used providing that the print on the outer jacket identifies fiber classifications per 4.2.3.

4.2.2 Unless otherwise specified, the outer jacket of indoor cable containing more than one fiber type shall use a printed legend to identify the quantities and types of fibers

within the cable. Table 3 shows the preferred nomenclature for the various fiber types. For example, a 12-fiber cable containing eight 50/125 µm and four 62.5/125 µm fibers may include “12 Fiber — 8 x OM3, 4 x OM1” in the jacket print statement.

4.2.3 When the print on the outer jacket of indoor cable is used to identify the types and classifications of the fiber, the use of the nomenclature of Table 3 is preferred.

4.3 Unless otherwise specified, sub-cable and cordage jackets within an indoor cable shall be color coded in accordance with 4.2. The color coding for groups, units, and fibers within such cable shall be in accordance with Table 1 and as described in 3.1 through 3.4.

5 Cable and wire color control and limits

5.1 Colors of fibers, units, or groups

Except as otherwise indicated, the colors of fibers, units, or groups within cables shall comply with the requirements of the Wire and Cable Limits defined in Table 4. For cable outer jackets, see 5.3. This Standard and EIA-359-A both specify colors by hue (H), value (V), and chroma (C) in terms of the Munsell Color System (ASTM D 1535).[3)] Other methods which map to the Munsell designations (e.g., colorimeter measurements in the L*a*b* system) may be used to determine compliance.

> NOTE - The relevant wire and cable requirements of EIA 359-A are included in Table 4. The requirements of Table 4 vary slightly from the requirements of EIA 359-A in that colors eleven and twelve are new, and colors four and five have been modified for fiber optic use. The specific wire and cable requirements of EIA 359-A are included in Table D-1 for information.

5.2 Deviations from Table 4

Some colorants, buffers, and inner jackets cannot meet these requirements due to their chemistry, or due to the chemistry of available compatible pigments. Examples are polyvinyl chloride (PVC) compounds (See Paragraph 5.4), translucent inks, and non-halogen or low-halogen buffers and jacket compounds. In such cases, deviations from the Wire and Cable Limits in Table 4 shall be allowed for all color-coded elements, but all colors shall be made as close to the required centroid as possible following design intent and good commercial practice. All colors shall be readily identifiable and clearly discernible.

3) Additional information about the Munsell Color System is available in many of the references cited in ASTM D 1535 or in any edition of the text *A Color Notation* by A. H. Munsell. This text and visual color standards meeting the requirements of EIA-359-A and Table 4 may be obtained from Macbeth, Division of Kollmorgen Instruments Corporation, 405 Little Britain Road, New Windsor, NY 12583-6148.

5.3 Colored outer jackets

When used, the colors of outer jackets for indoor cable shall conform as closely as possible to the requirements of clause 5, but exact color limits are not specified. The requirements for PVC colors are given in 5.4 and recommended centroids are listed in Table 5.

Table 4 - Munsell wire and cable color limits[1)]

Color	Centroid	Hue Limits		Value Limits		Chroma Limits	
		From	To	From	To	From	To
Blue (BL)	2.5PB 4/10	7.5B	5PB	3	5.2	8	> 8
Orange (OR)	2.5YR 6/14	10R	5YR	5	7	10	> 10
Green (GR)	2.5G 5/12	9GY	5G	4	6	8	> 8
Brown (BR)	2.5YR 3.5/6	7.5R	7.5YR	2.5	4.5	5	8
Slate (SL)	N 5/	--	--	4	6	0	1
White (WH)	N 9/	5RP	5GY	8.75	> 8.75	0	1
White (WH)	N 9/	5GY	5RP	8.75	> 8.75	0	0.5
White (WH)	N 9/	10YR	10Y	8.75	> 8.75	0	2
Red (RD)	2.5R 4/12	10RP	5.5R	3	5	10	> 10
Black (BK)	N 2/	--	--	0	2.3	0	0.5
Yellow (YL)	5Y 8.5/12	1.25Y	8.75Y	7.5	> 7.5	8	> 8
Violet (VI)	2.5P 4/10	10PB	5P	3	5.5	5.5	> 5.5
Rose (RS)	10RP 7/6	5R	5RP	6	8	4	> 4
Aqua (AQ)	10BG 7/6	5B	5BG	6	8	4	> 4

1) Differences between this Table and the component limits of EIA 359-A are listed at the end of Tables D-1. These differences exist within 359-A, or between 359-A and this document, but the basis of such differences are not known

5.4 Coloring of PVC materials

Manufacturing and material limitations of PVC compounds often do not permit compliance with either the specified centroid or limit colors of Table 4. Furthermore, color centroids for general purpose PVC differ from the color centroids for weatherized PVC. Weatherized PVC compounds typically attain their weather-resistant properties through the use of additives that affect the ability to color the compounds. Accordingly, unless otherwise agreed upon by the manufacturer and the user, centroid colors only are specified for PVC; recommended centroids are listed in Table 5. Annex B (informative) lists other jacket colors that may be used pursuant to 4.2.1.

5.5 Visual examination for color compliance

When using the Munsell color system for reference testing, specimens shall be tested for compliance as viewed under North Sky Daylight in the Northern hemisphere. The minimum intensity of illumination shall be 1076 lumens/square meter (100 foot-candles). See ASTM D 1535 for more information.

Table 5 - Color centroids for PVC compounds for Indoor Cable jackets

Color	General PVC	Weatherized PVC[1)]
Blue (BL)	2.5PB 5.5/10	2.5PB 4/10
Orange (OR)	8.75R 6/12	10R 6.5/12
Black (BK)	N1.5	N1.5
Yellow (YL)	5Y 8.5/12	2.5Y 8/8
Aqua (AQ)	10BG 7/6	Undefined[2)]

1) Weatherized PVC has different color codes. Orange, for example, is different to facilitate ink marking. For color control, consideration should be given to using a ΔE (deviation range vector) value for deviations from the centroid, where

$$\Delta E = \sqrt{(\Delta \text{Hue})^2 + (\Delta \text{Value})^2 + (\Delta \text{Chroma})^2}$$

with the Hue, Value, and Chroma in Munsell notation (see text footnote #3). Using this system, $\Delta E < 6$ indicates adequate control for most colors.

2) Munsell data for Aqua are not available for weatherized PVC.

6 Color permanence

It is the intent of this Standard that the colors used in accordance with this Standard shall be permanent for the design life of the cable. Any specific requirements or testing methods shall be as required by the Detail Specification.

Annex A (Normative)

Optical indoor cable definitions

Optical indoor cable is intended primarily for indoor use within a structure (home, commercial or industrial building, etc.) to transport fiber optic signals. The cable shall meet the appropriate National Electrical Code® requirements for particular installations (plenum cable, riser cable, or general purpose cable, as applicable), and other mechanical and/or environmental requirements as specified for the intended applications. When appropriately constructed, Indoor Cable may be suitable for limited outdoor applications. Indoor Cable normally consists of one or more fibers of specified fiber sizes, coated or coated and buffered to an appropriate specified diameter, and assembled into one of the following cable type configurations. These definitions are included to aid in applying the color coding requirements of clause 4.

For the purposes of this Standard, the following definitions apply.

A.1 Distribution Cable

Indoor Distribution Cable consists of two or more fibers, assembled individually or as members of multi-fiber units, and is normally intended for installation in relatively long lengths and in installations normally requiring each complete cable end to be terminated at a single location.

A.2 Interconnect Cable or Cord

An Interconnect Cable or Interconnect Cord consists of one or more fibers, reinforced and jacketed, and is intended for short distance applications. Single-fiber cable is often called simplex cable, while dual-fiber cable is often called duplex cable. The latter consists of two simplex cables or two individual fibers assembled with an overall jacket, or two simplex cables bonded together. These cables or cords are primarily used as intra-equipment jumpers or as patch cords. In bulk lengths, interconnect cables are referred to as single-fiber cordage or dual-fiber cordage.

A.3 Breakout Cable

Indoor Breakout Cable consists of two or more sub-cables assembled together under a common outer jacket in a manner such that each sub-cable can be separated from the main cable structure for routing to, and termination at, various locations.

Annex B (Informative)

Optical indoor cable jacket colors

Pursuant to 4.3, jacket colors other than those specified in Table 3 may be used for Optical Indoor Cable. The following table identifies the recommended color centroids for PVC jackets for all colors, including those other than the preferred colors in Table 3.

Table B-1 - Color centroids for PVC compounds

Color	General PVC	Weatherized PVC[1)]
Blue (BL)	2.5PB 5.5/10	2.5PB 4/10
Orange (OR)	8.75R 6/12	10R 6.5/12
Green (GR)	2.5G 5/12	2.5BG 5/9
Brown (BR)	2.5YR 3.5/6	7.5YR 5/4
Slate (SL)	N5 to N5.5	N5
White (WH)	N9 to N9.4	N9
Red (RD)	2.5R 4/12	5R 4/14
Black (BK)	N1.5	N1.5
Yellow (YL)	5Y 8.5/12	2.5Y 8/8
Violet (VI)	2.5P 4/10	2.5P 4/10
Rose (RS)	10RP 7/6	Undefined[2)]
Aqua (AQ)	10BG 7/6	Undefined[2)]

1) Weatherized PVC has a different color code. Blue and Orange, for example, are different to facilitate ink marking. For color control, consideration should be given to using a ΔE (deviation range vector) value for deviations from the centroid, where

$$\Delta E = \sqrt{(\Delta \text{Hue})^2 + (\Delta \text{Value})^2 + (\Delta \text{Chroma})^2}$$

with the Hue, Value, and Chroma in Munsell notation (see text footnote #3). Using this system, $\Delta E < 6$ indicates adequate control for most colors.

2) Munsell data for Rose and Aqua are not available for weatherized PVC.

Annex C (Informative)

Alternative color scheme

The color scheme in Table C-1 identifies the base color abbreviations used in IEC-60757. The position that each color occupies is the same as in Table 1, but it is not a position system specified by the IEC. At present, there is no agreement on a color positioning method in the IEC.

Table C-1 - Individual fiber, unit, and group identification

Position #	Base color and tracer[1] per IEC 60757	Abbreviation/print legend
1	Blue	1 or BU or 1-BU
2	Orange	2 or OG or 2-OG
3	Green	3 or GN or 3-GN
4	Brown	4 or BN or 4-BN
5	Grey	5 or GY or 5-GY
6	White	6 or WH or 6-WH
7	Red	7 or RD or 7-RD
8	Black	8 or BK or 8-BK
9	Yellow	9 or YE or 9-YE
10	Violet	10 or VT or 10-VT
11	Pink	11 or PK or 11-PK
12	Turquoise	12 or TQ or 12-TQ
13	Blue with Black Tracer	13 or D/BU or 13-D/BU[2]
14	Orange with Black Tracer	14 or D/OG or 14-D/OG
15	Green with Black Tracer	15 or D/GN or 15-D/GN
16	Brown with Black Tracer	16 or D/BN or 16-D/BN
17	Grey with Black Tracer	17 or D/GY or 17-D/GY
18	White with Black Tracer	18 or D/WH or 18-D/WH
19	Red with Black Tracer	19 or D/RD or 19-D/RD
20	Black with White Tracer[1]	20 or D/BK or 20-D/BK
21	Yellow with Black Tracer	21 or D/YE or 21-D/YE
22	Violet with Black Tracer	22 or D/VT or 22-D/VT
23	Pink with Black Tracer	23 or D/RS or 23-D/RS
24	Turquoise with Black Tracer	24 or D/TQ or 24-D/TQ
Table continued, following		

Table C-1 (*concluded*)

Position #	Base color and tracer[1] per IEC 60757	Abbreviation/print legend
25	Blue with Double Black Tracer	25 or DD/BU or 25-DD/BU[2]
26	Orange with Double Black Tracer	26 or DD/OG or 26-DD/OG
27	Green with Double Black Tracer	27 or DD/GN or 27-DD/GN
28	Brown with Double Black Tracer	28 or DD/BN or 28-DD/BN
29	Grey with Double Black Tracer	29 or DD/GY or 29-DD/GY
30	White with Double Black Tracer	30 or DD/WH or 30-DD/WH
31	Red with Double Black Tracer	31 or DD/RD or 31-DD/RD
32	Black with Double White Tracer[1]	32 or DD/BK or 32-DD/BK
33	Yellow with Double Black Tracer	33 or DD/YE or 33-DD/YE
34	Violet with Double Black Tracer	34 or DD/VT or 34-DD/VT
35	Pink with Double Black Tracer	35 or DD/PK or 35-DD/PK
36	Turquoise with Double Black Tracer	36 or DD/TQ or 36-DD/TQ

1) Other discernable tracer colors may be used as agreed to by the manufacturer and the user.
2) “D/” denotes a dashed mark or tracer per 3.6. That is, D/BL is Dash/Blue, meaning Blue with a tracer. “DD/” denotes a double dashed mark or tracer per 3.6. That is, DD/BL is Double Dash/Blue, meaning Blue with a double tracer.

Annex D (Informative)

Wire and cable Munsell limit chips from EIA 359-A

Table D-1: Table of Munsell Wire and Cable Limit Chips (From EIA 359-A)[4)]

Color	Centroid	Hue		Value		Chroma[6)]	
		H--	H++	V--	V++	C--	C++
Blue	2.5PB 4/10	7.5B 4/10	5 PB 4/10	2.5PB 3/10	2.5PB 5.2/10	2.5PB 4/8	None
Orange (OR)	2.5YR 6/14	10R 6/14	5YR 6/14	2.5YR 5/14	2.5YR 7/12	2.5YR 6/10	None
Green (GR)	2.5G 5/12	9GY 5/12	5G 5/12	2.5G 4/10	2.5G 6/12	2.5G 5/8	None
Brown (BR)	2.5YR 3.5/6	7.5R 3.5/6	7.5YR 3.5/6	2.5YR 5/6	2.5YR 4.5/6	2.5YR 3.5/2[5)]	2.5YR 3.5/8
Slate (SL)	N 5/	Any		N 4/	N 6/	5R 5/1 5B 5/1 5Y 5/1 5P 5/1 5G 5/1	
Slate (SL)	N 5/	Any		N 4/	N 6/		
Slate (SL)	N 5/	Any		N 4/	N 6/		
White (WH)	N 9/	Any		N 8.75/	None	5R 9/1 5G 9/0.5 5YR 9/1 5B 9/0.5 5Y 9/1 5P 9/0.5 See Notes 1) and 2)	
White (WH)	N 9/	Any		N 8.75/	None		
White (WH)	N 9/	Any		N 8.75/	None		
Red (RD)	2.5R 4/12	10RP 4/12	5.5R 4/12	2.5R 3.5/12[3)]	2.5R 5/12	2.5R 4/10	None
Black (BK)	N 2/	Any		None	N 2.3/	2R 2/0.5 2B 2/0.5 2Y 2/0.5 2P 2/0.5 2G 2/0.5	
Black (BK)	N 2/	Any		None	N 2.3/		
Black (BK)	N 2/	Any		None	N 2.3/		
Yellow (YL)	5Y 8.5/12	1.25Y 8.5/12	8.75Y 8.5/12	5Y 7.5/12	None	5Y 8.5/8	None
Violet (VI)	2.5P 4/10	10PB 4/10	5P 4/10	2.5P 3/10	2.5P 5.5/10	2.5P 4/5.5	None

The following are differences between this Table and Table 4. These differences exist within 359-A, or between 359-A and this document, but the basis of such differences are not known:

1) Table 4: WH – Max of “2” for Chroma if Hue between “10YR &10Y” (vs. “1”).
2) Table 4: WH – Has different ranges of Hue for various upper Chroma limits.
3) Table 4: RD – Has lower limit of “3” for Value (vs. “3.5”).
4) Table 4: RS – Allowed range of values for Chroma (“4-6”) at upper Value limit
   Note: 359 did not have requirements for RS & AQ
5) Table 4: BR – Allowed lower limit of “5” for Chroma (vs. “2”).
6) EIA 359A: Different values of Chroma for upper and lower Value limits.

Annex E (Informative)

Munsell component limits for Rose and Aqua

The Munsell component limits for Rose and Aqua in Table E-1 are the standard tolerance for these colors. They are derived from tighter wire and cable limits and are provided for information only, as they do not exist in any other Standard. For other Munsell component color limits, refer to EIA 359-A.

Table E-1: Munsell component color limits for colors eleven and twelve

Tolerance	Color 11, Rose	Color 12, Aqua
Centroid	10RP 7/6	10BG 7/6
Component Limits:		
H+	2.5R 7/6	2.5B 7/6
H -	7.5RP 7/6	7.5BG 7/6
V+	10RP 7.5/4–6	10BG 7.5/4–6
V -	10RP 6.5/6	10BG 6.5/6
C+	10RP 7/8	10BG 7/8
C -	10RP 7/4	10BG 7/4

Annex F (Informative)

Comparison between TIA-598 and IEC and ITU requirements

F.1 Introduction

One of TIA's policy objectives is to promote, whenever possible, the worldwide harmonization of fiber-optic standards.

This Appendix gives users of this document an indication of comparable standards that have been adopted, or are in preparation, by IEC and ITU.

F.2 Documents in print

There are no known standards in print comparable to this document in either the IEC or the ITU-T. IEC 60304, the most often referenced IEC color standard, presents nominal colors in the form of color chips for the twelve colors, with range limits. It also discusses numerical abbreviations—an approach that is not applicable to fiber optics.

F.3 Documents in preparation

There are no known standards proposals in the IEC or ITU-T.

THE TELECOMMUNICATIONS INDUSTRY ASSOCIATION

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