

Low Tension Primary Cable

TABLE OF CONTENTS

1.	Scope	1
2.	References	1
3.	Definitions.....	3
4.	General.....	4
5.	General Specifications	5
6.	Tests.....	7
7.	Reference Information.....	19
Appendix A Outside Diameter and Minimum Wall Thickness—English Units		21
Appendix B Recommended Colors		22
Appendix C Sources for Reference Materials.....		23

1. Scope—This SAE Standard covers low tension primary cable intended for use at a nominal system voltage of 60 V DC (25 V AC) or less in surface vehicle electrical systems. The tests are intended to qualify cables for normal applications with limited exposure to fluids and physical abuse.

2. References

2.1 Applicable Publications—The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE EA-1128—Wire Color Charts

SAE J311—Fluid for Passenger Car Type Automatic Transmission

SAE Dictionary of Materials and Testing

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

TO PLACE A DOCUMENT ORDER; (724) 776-4970 FAX: (724) 776-0790
SAE WEB ADDRESS <http://www.sae.org>

Copyright 2000 Society of Automotive Engineers, Inc.
All rights reserved.

Printed in U.S.A.

**This document is now
PUBLIC**

2.1.2 ASTM DOCUMENTS—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

ASTM B 1—Standard Specification for Hard-Drawn Copper Wire
ASTM B 33—Standard Specification for Tinned Soft or Annealed Copper Wire
ASTM B 174—Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors
ASTM B 263—Method for Determination of Cross-Sectional Area of Standard Conductors
ASTM B 298—Standard Specification for Silver-Coated Soft or Annealed Copper Wire
ASTM B 354—Definitions of Terms Relating to Uninsulated Metallic Electrical Conductors
ASTM B 355—Standard Specification for Nickel-Coated Soft or Annealed Copper Wire
ASTM D412—Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 471—Standard Test Method for Rubber Property – Effect of Liquids
ASTM D 573—Standard Test Method for Rubber - Deterioration in an Air Oven
ASTM E 145—Standard Specification for Gravity-Convection and Forced-Ventilation Ovens
ASTM F1251—Standard Terminology Relating to Polymeric Biomaterials in Medical and Surgical Device

2.1.3 IEC DOCUMENTS—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002

IEC 811-2-1—Common test methods for insulating and sheathing materials of electrical cables—Part 2: Methods specific to elastomeric compounds—Section 1: Ozone resistance test—Hot set test—Mineral oil immersion test.
IEC, Electricity, Electronics and Telecommunications, Multilingual Dictionary

2.2 Related Publications—The following publications are provided for information purposes only and are not a required part of this specification.

2.2.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J156—Fusible Links
SAE J1067—Seven Conductor Jacketed Cable for Truck Trailer Connections
SAE J1127—Low Tension Battery Cable
SAE J1292—Automobile, Truck, Truck-Tractor, Trailer, And Motor Coach Wiring
SAE J1654—High Voltage Primary Cable
SAE J1673—High Voltage Automotive Wiring
SAE J1678—Ultra Thin Wall Primary Cable
SAE J2183—60 V and 600 V single core cables - Test methods, dimensions and requirements
SAE J2501—Round, unscreened, 60 V and 600 V multicore sheathed cables - Basic and high performance test methods and requirements

2.2.2 ASTM DOCUMENTS—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959

ASTM B 3—Standard Specification for Soft or Annealed Copper Wire
ASTM B 8—Concentric-Lay-Stranded Copper conductors, Hard, Medium-Hard, or Soft
ASTM B 452—Standard Specification for Copper-Clad Steel Wire for Electronic Application
ASTM B 787—19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation

2.2.3 ISO DOCUMENTS—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002

ISO6722—Road vehicles—60 V and 600 V single core cables—Test methods, dimensions and requirements

ISO14572—Road vehicles—Round, unscreened, 60 V and 600 V multicore sheathed cables—Basic and high performance test methods and requirements

3. **Definitions**

3.1 **Additional Mass (reference “Sandpaper Abrasion Resistance” test)**—The mass which is applied to the support rod. The combination of the forces exerted by the additional mass and the 0.63 N exerted by the remaining apparatus (bracket, support rod, and pivoting arm) is applied to the cable.

3.2 **Coated Wire**—Wire comprised of a given metal covered with a relatively thin application of a different metal. (ASTM B 354)

3.3 **Cable**—See primary cable.

3.4 **Conductor**—A wire or combination of wires not insulated from one another, suitable for carrying an electrical current. (ASTM B 354)

3.5 **Core**—See conductor.

3.6 **Fluid Compatibility**—The ability of a cable to resist the effects of various fluids found in surface vehicles.

3.7 **Hot Plate**—An electrically heated device used to test thermoset cables.

3.8 **Low Voltage**—Usually considered to be ≤ 60 V DC (25 V AC).

3.9 **Minimum Wall (Thickness)**—The lowest allowable insulation thickness at any point.

3.10 **Nominal**—A suitable approximate value used to designate or identify a component.

3.11 **Ozone Resistance**—The ability of a material to withstand the deteriorating effect of ozone (surface cracking). SAE, Dictionary of Materials and Testing.

3.12 **Plastic**—Any of numerous polymeric materials that are usually thermoplastic or thermosetting, of high molecular weight and that can be molded, cast, extruded, drawn, laminated, or otherwise fabricated into objects, powders, beads, films, filaments, fibers, or other shapes. (ASTM F 1251)

3.13 **Primary Cable**—The single or multi-stranded, single conductor, insulated cable used to carry electric current, by attachment to the low voltage side of an ignition coil in surface vehicles.

3.14 **SAE Wire Size**—A system that indicates the cross sectional area of the conductor. The Metric SAE Wire Size is the approximate area of the conductor. The English SAE Wire Size number indicates that the area of the conductor approximates the area of the American Wire Gauge for the equivalent size.

3.15 **Separator**—A thin layer used as a barrier to prevent mutually detrimental effects between different components of a cable such as between the conductor and insulation or between the insulation and the sheath. (IEC, Electricity, Electronics and Telecommunications, Multilingual Dictionary)

3.16 **Strip Force**—The peak axial force required to overcome the adhesion between the conductor and the insulation.

3.17 Strand—See wire.

3.18 Temperature Class Rating—A class designation based on the retention of “Mechanical Properties” (tensile and elongation) after 168 h of heat aging at 30 °C above the temperature class rating.

3.19 Thermoplastic—A plastic capable of being softened by heating and hardened by cooling through a temperature range characteristic of the plastic and, in the softened state, capable of being repeatedly shaped by flow into articles by molding, extrusion, or forming. (IEC, Electricity, Electronics and Telecommunications, Multilingual Dictionary)

3.20 Thermoset—A plastic which, when cured by heat or other means, changes into a substantially infusible and insoluble product.

NOTE—Thermosets are often called thermosetting before curing and thermoset after cure. (IEC, Electricity, Electronics and Telecommunications, Multilingual Dictionary)

3.21 Wire (Strand)—A rod or filament of drawn or rolled metal whose length is great in comparison with the major axis of its cross section. (ASTM B 354)

3.22 Wire Size—See SAE wire size.

4. General

4.1 Cable Types—See Figure 1.

Type TWP Thin Wall, Thermoplastic Insulated
 Type GPT General Purpose, Thermoplastic Insulated
 Type HDT Heavy Duty, Thermoplastic Insulated
 Type STS Standard Duty, Thermoset Elastomer (Synthetic Rubber) Insulated
 Type HTS Heavy Duty, Thermoset Elastomer (Synthetic Rubber) Insulated
 Type TXL Thin Wall, Cross (X) Linked Polyolefin Insulated
 Type GXL General Purpose, Cross (X) Linked Polyolefin Insulated
 Type SXL Special Purpose, Cross (X) Linked Polyolefin Insulated
 Type TWE Thin Wall, Thermoplastic Elastomer Insulated
 Type GTE General Purpose, Thermoplastic Elastomer Insulated
 Type HTE Heavy Duty, Thermoplastic Elastomer Insulated

Insulation	SAE Cable Types			
	Thin Wall	General Purpose	Special Purpose	Heavy Wall
Thermoplastic	TWP	GPT		HDT
Thermoset Elastomer			STS	HTS
Crosslinked Polyolefin	TXL	GXL	SXL	
Thermoplastic Elastomer	TWE	GTE		HTE

FIGURE 1—CABLE TYPES REFERENCE 4.1

4.2 General Test Conditions—Test samples shall be preconditioned for at least 16 h at a room temperature of $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$. Unless otherwise specified, all tests shall be conducted at this same temperature.

4.3 Tolerances—Unless otherwise specified, all values are considered to be approximate.

5. General Specifications—The finished cable shall meet the requirements for all tests specified in Figure 2 for each cable type.

Clause	Description	Required For SAE Cable Types						If Required
		TWP TWE	GPT GTE	HDT HTE	STS TXL	HTS GXL	SXL	
5	General Specifications							
5.1	Conductor		*			*		
5.2	Insulation							
5.3	Outside Diameter		*			*		
5.4	Minimum Wall Thickness		*			*		
6	Tests							
6.1	Strand Coating		Note 1			Note 1		
6.2	Solderability		*			*		
6.3	Mechanical Properties		*			*		
6.4	Dielectric		*			*		
6.5	Cold Bend		*			*		
6.6	Flame Resistance		*			*		
6.7	Fluid Compatibility		*			*		
6.8	Ozone Resistance							Note 2, 5, & 6
6.9	Pinch Resistance		*			*		
6.10	Sandpaper Abrasion Resistance		*			*		
6.11	Crosslinking					*		
6.12	Strip Force		*			*		Note 3, & 6
6.13	Hot Water Resistance							Note 2, 5, & 6
6.14	Insulation Volume Resistivity							Note 4, & 6
6.15	Environmental Cycling							Note 2, 5, & 6

Notes:

- 1) This test is only required for coated copper wires.
- 2) At least one wire size shall be tested; however, for comparative purposes 0.8 mm² (No. 18) is preferred.
- 3) The requirements for the "Strip Force" test, if any, will be established by agreement between the supplier and the customer.
- 4) This test is only used as part of the "Hot Water Resistance" test
- 5) This test is for initial qualification only.
- 6) The usage of "If Required" tests will be established by agreement between customer and supplier.

FIGURE 2—GENERAL SPECIFICATIONS REFERENCE Section 5

5.1 Conductors—The finished, uninsulated conductor, shall meet the elongation requirements specified in ASTM B 174. When tin, silver, or nickel coated wires are used, they shall withstand the applicable “Strand Coating” test specified in 6.1 and Figure 2. The cross-sectional area of stranded conductors shall not be less than the values specified in Figure 3. The cross-sectional area may be verified by measuring actual strand sizes or by using the weight method in ASTM B 263 with a calculated factor to account for the twist loss.

NOTE—Hard copper wire per ASTM B 1 may be used for wire sizes smaller than SAE wire size 0.50 mm² (No. 20) when agreed between the supplier and purchaser.

Metric		English	
SAE Wire Size mm ²	Minimum Conductor Area mm ²	SAE Wire Size No.	Minimum Conductor Area circular mils
0.22	0.205	24	405
0.35	0.324	22	681
0.5	0.508	20	1,072
0.8	0.760	18	1,537
1	1.12	16	2,336
2	1.85	14	3,702
3	2.91	12	5,833
5	4.65	10	9,343
8	7.23	8	14,810

Notes:

- English units are not direct conversions from metric.
- The metric wire size is the approximate nominal area of the conductor.
- The SAE wire size number indicates that the cross sectional area of the conductor approximates the area of the American Wire Gauge for the equivalent size.
- When agreed between the supplier and the purchaser, splices may be used for the conductor as a whole provided that they meet the following conditions:
 - The break strength shall not be reduced by more than 20%.
 - The resistance shall not be increased.
 - The diameter of the splice must not exceed the diameter of the uninsulated conductor.

FIGURE 3—CONDUCTORS REFERENCE 5.1

5.2 Insulation—The insulation shall be homogeneous and shall be placed concentrically within commercial tolerances about the conductor. The insulation shall adhere closely to, but strip readily from, the conductors leaving them in suitable condition for terminating. A separator shall be used between uncoated conductors and insulations with a sulfur cure. Separators are optional for other constructions.

5.3 Outside Diameter—The “Outside Diameter” shall be measured at five separate cross sections spaced 50 mm (2 in) apart with an optical device accurate to at least 0.01 mm (0.001 in). Other devices may be used; however, in case of dispute, the referee shall be the optical device. A minimum of two readings shall be taken at each cross section. The sample should be rotated 90 degrees between readings. The mean of the diameter readings shall determine the finished cable diameter and shall be in accordance with Figure 4 for the various cable types.

5.4 Minimum Wall Thickness—The “Minimum Wall Thickness” shall be measured at five separate cross sections spaced 400 mm (16 in) apart using the equipment described in 5.3. All individual minimum wall measurements must be in accordance with Figure 4.

6. Tests

6.1 Strand Coating—The “Strand Coating” test shall be conducted on individual strands prior to stranding and shall be conducted per ASTM B 33, B 298, or B 355. This test is not required for uncoated strands.

6.2 Solderability—25 mm (1 in) of insulation shall be removed from a 300 mm (12 in) sample of finished cable. 12 mm (0.5 in) of the stripped end shall be immersed into a component lead tinning flux such as Kester #2164, water soluble flux for 3 to 5 s. The stripped end shall then be immersed in solder [30% to 40% Sn, remainder Pb] at 400 to 425 °C for 3 to 5 s. Other fluxes, solders, and temperatures may be used; however, in case of a dispute, the referee shall be the Kester #2164 and the solder and temperature shown in this specification. A visual inspection shall reveal no area in the immersed section which is not covered by solder.

6.3 Mechanical Properties—An accelerated aging test shall be conducted in accordance with ASTM D 412, D573, E 145 Type II except using specimens of insulation removed from finished cable. The sample shall be stretched at a rate of 50 mm/min (2 in/min). 500 mm/min may be used as the strain rate; however, in case of a dispute, the referee method will be a 50 mm/min strain rate. The original and conditioned samples must both be elongated at the same strain rate. The original properties shall conform to the values shown in Figure 5. Samples of insulation shall be aged 168 h in a circulating air oven. The test temperature shall be as shown in Figure 5. After aging, the tensile strength shall not be less than 80% of the original test value and the elongation shall not be less than 50% of the original test value.

TWE, GTE, or HTE samples may be conditioned at the test temperature for 24 h prior to taking the original measurements. The samples will then be conditioned for an additional 168 h (192 h total). The tensile strength after 192 h of conditioning shall not be less than 80% of the measured value after 24 h. The elongation after 192 h of conditioning shall not be less than 50% of the measured value after 24 h.

6.4 Dielectric—25 mm (1 in) of insulation shall be removed from each end of a 600 mm (24 in) sample of finished cable and the two ends twisted together. The loop thus formed shall be immersed in water containing 5% salt by weight at room temperature so that not more than 150 mm (6 in) of each end of the sample protrudes above the solution. After being immersed for 5 h and while still immersed, the sample shall withstand the application of 1000 V rms at (50 to 60) Hz between the conductor and the solution for 1 min without failure of the insulation.

SAE Wire Size mm ²	SAE Cable Type											
	TWP TWE TXL				GPT GTE GXL				STS SXL			
	Wall Thickness Nominal mm	Minimum mm	Maximum OD mm		Wall Thickness Nominal mm	Minimum mm	Maximum OD mm		Wall Thickness Nominal mm	Minimum mm	Maximum OD mm	
0.22	0.40	0.28	1.50									
0.35	0.40	0.28	1.70									
0.5	0.40	0.28	1.90		0.58	0.41	2.40		0.74	0.52	2.80	3.10
0.8	0.40	0.28	2.20		0.58	0.41	2.50		0.76	0.53	3.00	3.40
1	0.40	0.28	2.40		0.58	0.41	2.90		0.81	0.57	3.40	3.70
2	0.40	0.28	2.70		0.58	0.41	3.20		0.89	0.62	3.90	4.20
3	0.46	0.32	3.30		0.66	0.46	3.80		0.94	0.66	4.60	5.10
5	0.50	0.35	4.00		0.79	0.55	4.70		1.04	0.73	5.30	5.70
8	0.55	0.39	4.90		0.94	0.66	6.00		1.09	0.76	6.20	7.00
Note: For reference only, English units are included in Appendix A.												

FIGURE 4—OUTSIDE DIAMETER AND MINIMUM WALL THICKNESS
REFERENCE 5.3 AND 5.4

SAE Cable Type	Minimum Tensile Strength		Minimum Elongation	Test Temperature Ref. Clause 6.3 °C ± 2°C	Temperature Class Rating Ref. Clause 6.15 °C ± 2°C
	MPa	psi	%		
TWP GPT HDT	11	1600	125	110	80
STS HTS	7	1000	150	110	80
TXL GXL SXL	10	1500	150	155	125
TWE GTE HTE	11	1600	200	150	120

Notes:

1. The above accelerated aging temperatures are appropriate for insulating materials currently specified in this standard. Different test conditions may be necessary for other materials.
2. English units are not direct conversions from metric.

FIGURE 5—MECHANICAL PROPERTIES AND ENVIRONMENTAL CYCLING
TEST CONDITIONS REFERENCE 6.3 AND 6.15

- 6.5 Cold Bend**—25 mm (1 in) of insulation shall be removed from each end of a 1000 mm (40 in) sample of finished cable. The sample shall be placed in a cold chamber at $-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for a period of 3 h. While the sample is still at this low temperature, it shall be wrapped around a mandrel for a minimum of 180 degrees at a uniform rate of one turn in 10 s. The mass and mandrel size shall be as specified in Figure 6. Either a revolving or stationary mandrel may be used. When a revolving mandrel is used, fasten one end of the sample to the mandrel and the specified mass to the other end. No mass is required when using a stationary mandrel. A visual inspection shall reveal no cracks or splits. The sample is to be returned to room temperature and then subjected to the dielectric test specified in 6.4.

Metric					English				
SAE Wire Size mm ²	SAE Cable Type				SAE Wire Size No.	SAE Cable Type			
	TWP GPT HDT STS HTS		TXL GXL SXL TWE GTE HTE			TWP GPT HDT STS HTS		TXL GXL SXL TWE GTE HTE	
	Mandrel Dia. mm	Mass kg	Mandrel Dia. mm	Mass kg		Mandrel Dia. in	Mass lb	Mandrel Dia. in	Mass lb
0.22	25	0.45	25	0.68	24	1.0	1.0	1.0	1.5
0.35	25	0.45	25	0.68	22	1.0	1.0	1.0	1.5
0.5	75	0.45	25	0.68	20	3.0	1.0	1.0	1.5
0.8	75	0.45	25	0.68	18	3.0	1.0	1.0	1.5
1	75	0.45	25	0.68	16	3.0	1.0	1.0	1.5
2	150	0.45	75	1.4	14	6.0	1.0	3.0	3.0
3	150	1.4	75	2.3	12	6.0	3.0	3.0	5.0
5	150	1.4	75	2.3	10	6.0	3.0	3.0	5.0
8	150	1.4	150	2.3	8	6.0	3.0	6.0	5.0
Note: English dimensions are not direct conversions from metric.									

FIGURE 6—COLD BEND AND FLUID COMPATIBILITY TEST CONDITIONS REFERENCE 6.5 AND 6.7

6.6 Flame Resistance—A 600 mm (24 in) sample of finished cable shall be suspended taut at 45 degrees to a horizontal plane within a partial enclosure which allows a flow of sufficient air for complete combustion but is free from drafts. A gas burner shall be used having a 13 mm (1/2 in) inlet, a nominal core of 10 mm (3/8 in), and a length of 100 mm (4 in) above the primary inlets. The gas burner shall be adjusted to produce a 100 mm (4 in) gas flame with an inner cone 1/2 of its height. The gas burner shall be positioned beneath the test sample and perpendicular to the axis of the test sample. The top of the inner cone of the flame shall be applied as shown in Figure 7. The time of application of the flame shall be 15 s. However, the exposure time shall not be longer than the time at which the conductor becomes visible. After removal of the gas burner flame, the test sample shall not continue to burn for more than 70 s and a minimum of 50 mm (2 in) of insulation at the top of the test sample shall remain unburned.

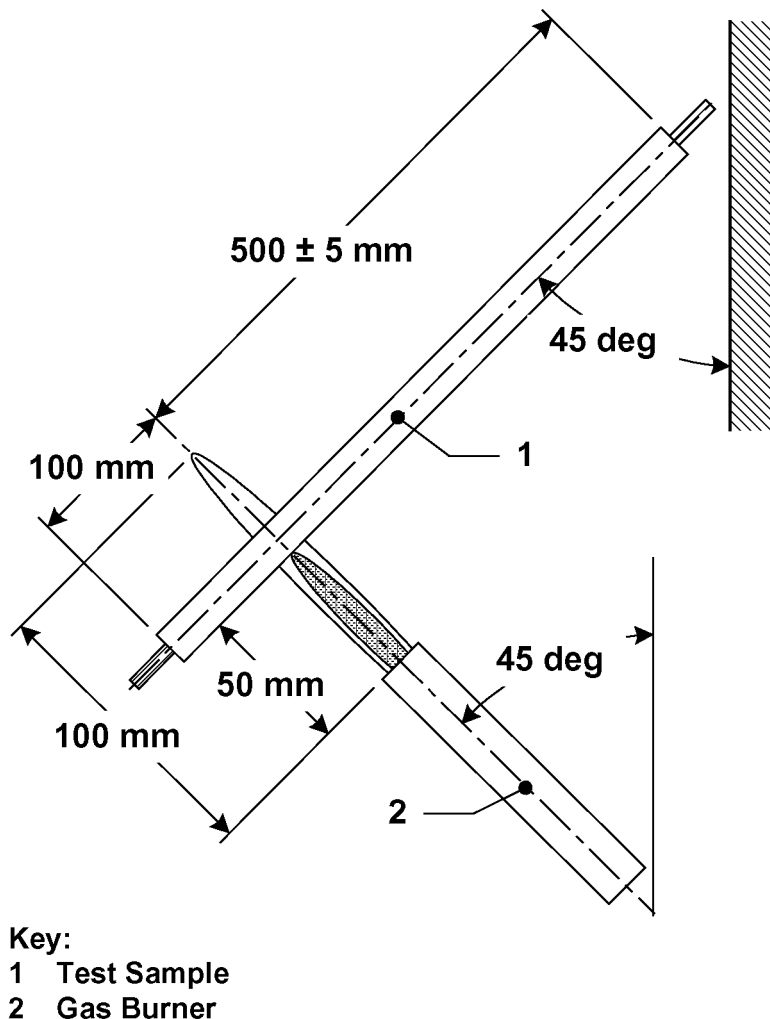


FIGURE 7—APPARATUS FOR FLAME RESISTANCE TEST REFERENCE 6.6

6.7 Fluid Compatibility—25 mm (1 in) of insulation shall be removed from each end of 1000 mm (40 in) samples of finished cable. A separate sample shall be used for each fluid. The original outside diameter shall be measured using the procedure described in 5.3. The area of the sample to be subjected to the bend test shall be immersed in the fluid shown in Figure 8 for a period of 20 (+1, -0) h. After removal from the fluid, remove excess fluid from the sample and then condition the sample for 4 h at room temperature. After conditioning, the outside diameter of the cable shall again be measured using the procedure in 5.3. The mean of the diameter readings taken after conditioning shall be compared to the mean of the original diameter readings. The maximum diameter change shall be in accordance with Figure 8. The conditioned sample shall be wrapped around a mandrel as specified in Figure 6 for a minimum of 180 degrees at a uniform rate of one turn in 10 s. Either a revolving or stationary mandrel may be used. When a revolving mandrel is used, fasten one end of the sample to the mandrel and the specified mass to the other end. No mass is required when using a stationary mandrel. A visual inspection shall reveal no cracks or splits. If no exposed conductor is visible, subject the sample to the dielectric test specified in 6.4.

Test Fluid		Test Temp °C	Maximum OD Change %
Name	Fluid		
Engine Oil	ASTM D471, IRM-902	50 ± 3	15
Gasoline	ASTM D471, Ref. Fuel C	23 ± 5	15
Ethanol	85% Ethanol + 15% ASTM D471, Ref. Fuel C	23 ± 5	15
Diesel Fuel	90% ASTM D471, IRM 903 + 10% p-xylene	23 ± 5	15
Power Steering	ASTM D471, IRM-903	50 ± 3	30
Auto Trans	Dexron III, SAE J311	50 ± 3	25
Engine Coolant	50% Distilled Water + 50% Ethylene Glycol	50 ± 3	15
Battery Acid	H ₂ SO ₄ , Specific Gravity = 1.260 ± .005	23 ± 5	5
Note: Solutions are determined as % by volume.			

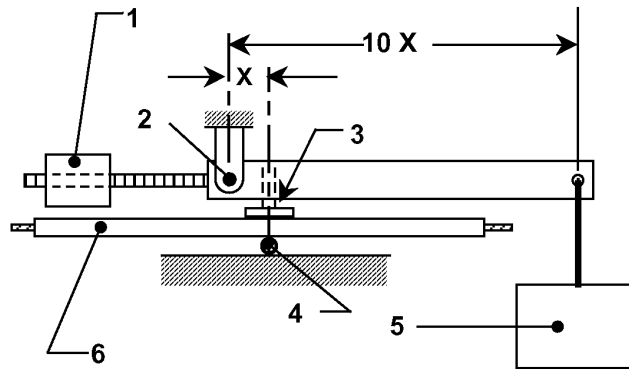
FIGURE 8—FLUID COMPATIBILITY REFERENCE 6.7

6.8 Ozone Resistance—This test is for initial qualification only. The usage of this test will be established by agreement between customer and supplier. At least one wire size shall be tested; however, for comparative purposes 0.8 mm² (No. 18) is preferred. A 300 mm (12 in) sample of finished cable shall be wound a minimum of 180 degrees around the mandrel specified in Figure 9 at a uniform rate of one turn in 10 s and secured. The assembly shall then be conditioned for 192 h +1, -0 h at (65 °C ± 3 °C in an atmosphere containing 100 pphm ± 5 pphm of ozone. A visual inspection shall reveal no cracks or splits.

6.9 Pinch Resistance—25 mm (1 in) of insulation shall be removed from one end of a 900 mm (36 in) sample of finished cable. The test sample shall then be placed taut without stretching across a 3 mm (1/8 in) diameter steel rod as shown in Figure 10. The counter balance shall be adjusted so that no force will be exerted on the test sample until a mass is applied to the end of the lever with a mechanical advantage of 10. The test sample shall then be subjected to an increasing force applied through the steel anvil by increasing the applied mass at a rate of 2.3 kg/min (5 lb/min). At the moment the insulation is pinched through, the 3 mm (1/8 in) diameter rod will contact the conductor and the test shall stop. The applied mass shall then be recorded. After each reading the test sample shall be moved 50 mm (2 in) and rotated clockwise 90 degrees. Four readings shall be obtained for each test sample. The mean of the four readings shall determine the pinch resistance of the cable under test. The minimum values for each cable type and size are shown in Figure 11.

SAE Wire Size mm ²	SAE Cable Type			
	<u>TWP TXL TWE</u>	<u>GPT GXL GTE</u>	<u>STS SXL</u>	<u>HDT HTS HTE</u>
	Mandrel Dia. mm	Mandrel Dia. mm	Mandrel Dia. mm	Mandrel Dia. Mm
0.22	6			
0.35	6			
0.5	6	6	6	13
0.8	6	6	13	13
1	6	13	13	13
2	6	13	13	13
3	13	13	13	19
5	13	13	19	19
8	13	19	19	19

FIGURE 9—OZONE RESISTANCE TEST CONDITIONS REFERENCE 6.8



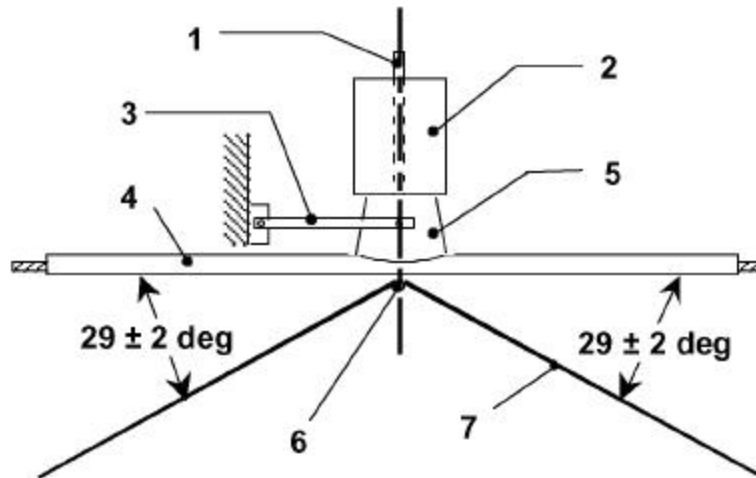
- Key**
- 1 Counter Balance
 - 2 Pivot
 - 3 Anvil
 - 4 Rod
 - 5 Applied Mass
 - 6 Test Sample

FIGURE 10—APPARATUS FOR PINCH RESISTANCE TEST REFERENCE 6.9

Metric											
SAE Wire Size mm ²	SAE Cable Type										
	TWP kg	GPT kg	HDT kg	STS kg	HTS kg	TXL kg	GXL kg	SXL kg	TWE kg	GTE kg	HTE kg
0.22	1.2					2.3			1.5		
0.35	1.2					2.7			1.5		
0.5	1.5	2.3	4.1	3.6	4.5	2.7	5.0	5.9	2.0	3.6	5.9
0.8	1.5	2.7	4.5	3.6	4.5	3.2	6.4	9.1	2.0	4.1	6.8
1	2.0	2.7	5.9	3.6	4.5	3.6	6.8	10	2.5	4.1	7.3
2	2.0	3.6	6.8	3.6	4.5	4.1	7.3	11	2.5	4.5	8.6
3	2.5	3.6	8.2	3.6	4.5	4.5	8.6	12	3.0	5.3	10
5	2.5	4.5	11	3.6	4.5	5.5	10	15	3.0	6.4	11
8	3.0	5.0	15	3.6	4.5	5.9	13	16	3.5	7.7	13
English											
SAE Wire Size No.	SAE Cable Type										
	TWP lb	GPT lb	HDT lb	STS lb	HTS lb	TXL lb	GXL lb	SXL lb	TWE lb	GTE lb	HTE lb
24	2.6					5.0			3.3		
22	2.6					6.0			3.3		
20	3.3	5.0	9.0	8.0	10	6.0	11	13	4.4	8.0	13
18	3.3	6.0	10	8.0	10	7.0	14	20	4.4	9.0	15
16	4.4	6.0	13	8.0	10	8.0	15	22	5.5	9.0	16
14	4.4	8.0	15	8.0	10	9.0	16	25	5.5	10	19
12	5.5	8.0	18	8.0	10	10	19	27	6.6	12	22
10	5.5	10	24	8.0	10	12	22	33	6.6	14	23
8	6.6	11	32	8.0	10	13	28	36	7.7	17	28
Note: English units are not direct conversions from metric.											

FIGURE 11—MINIMUM PINCH RESISTANCE REFERENCE 6.9

6.10 Sandpaper Abrasion Resistance—25 mm (1 in) of insulation shall be removed from one end of a 900 mm (36 in) sample of finished cable. The test sample shall then be placed taut, without stretching in a horizontal position (see Figure 12). The additional mass specified in Figure 13 and a suitable bracket shall be used to maintain the test sample position over an unused area of the abrasion tape. The total weight of the bracket, support rod, and pivoting arm shall be $0.63 \text{ N} \pm 0.05 \text{ N}$ ($0.14 \text{ lb} \pm 0.01 \text{ lb}$). 150J garnet sandpaper with 10 mm ($3/8$ in) conductive strips perpendicular to the edge of the sandpaper spaced a maximum of every 75 mm (3 in) shall be used to abrade the insulation. The DC resistance of the conductive strips shall be $15000 \text{ } \Omega$ (when measured across the width of the sandpaper) or low enough to allow the apparatus to detect exposed conductor. The sandpaper shall be pulled under the cable at a rate of $1500 \text{ mm/min} \pm 75 \text{ mm/min}$ ($60 \text{ in/min} \pm 3.0 \text{ in/min}$) until a conductive strip contacts the metallic conductor. A reading shall be taken of the length of sandpaper used to abrade through the insulation. The sandpaper shall approach and exit the test sample from below at an angle of $29 \text{ degrees} \pm 2 \text{ degrees}$ to the axis of the cable and shall be supported by a pin $6.9 \text{ mm} \pm 0.1 \text{ mm}$ ($0.272 \text{ in} \pm 0.004 \text{ in}$) in diameter. After each reading, the test sample shall be moved 50 mm (2 in) and rotated clockwise 90 degrees. Four readings shall be obtained for each test sample. The mean of the readings will determine the abrasion resistance. The sandpaper abrasion resistance shall meet or exceed the minimum abrasion requirements in Figure 14.



Key:

- 1 Support Rod
- 2 Additional Mass
- 3 Pivoting Arm
- 4 Test Sample
- 5 Bracket
- 6 Tape Supporting Pin
- 7 Sandpaper Abrasion Tape

FIGURE 12—APPARATUS FOR SANDPAPER ABRASION RESISTANCE TEST REFERENCE 6.10

Metric					
SAE Wire Size mm ²	SAE Cable Types				
	TWP TXL	GPT GXL	HDT HTE	STS SXL	HTS
	TWE Mass kg	GTE Mass kg	Mass kg	Mass kg	Mass kg
0.22	0.22				
0.35	0.22				
0.5	0.22	0.45	1.4	0.45	0.45
0.8	0.22	0.45	1.4	0.45	0.45
1	0.22	0.45	1.4	0.45	0.45
2	0.22	0.45	1.9	0.45	1.4
3	0.45	1.4	1.9	1.4	1.4
5	0.45	1.4	1.9	1.4	1.4
8	0.45	1.4	1.9	1.4	1.4
English					
SAE Wire Size No.	SAE Cable Types				
	TWP TXL	GPT GXL	HDT HTE	STS SXL	HTS
	TWE Mass lb	GTE Mass lb	Mass lb	Mass lb	Mass lb
24	0.5				
22	0.5				
20	0.5	1.0	3.0	1.0	1.0
18	0.5	1.0	3.0	1.0	1.0
16	0.5	1.0	3.0	1.0	1.0
14	0.5	1.0	4.25	1.0	3.0
12	1.0	3.0	4.25	3.0	3.0
10	1.0	3.0	4.25	3.0	3.0
8	1.0	3.0	4.25	3.0	3.0
Notes:					
1. English units are not direct conversions from metric.					
2. See FIGURE 14 for minimum abrasion resistance.					

FIGURE 13—SANDPAPER ABRASION RESISTANCE ADDITIONAL MASS REFERENCE 6.10

Metric											
SAE Wire Size mm ²	SAE Cable Type										
	TWP mm	GPT mm	HDT mm	STS mm	HTS Mm	TXL mm	GXL mm	SXL mm	TWE mm	GTE mm	HTE mm
0.22	225					225			225		
0.35	250					250			250		
0.5	300	400	350	460	760	300	400	550	300	400	350
0.8	350	410	400	530	890	350	410	700	350	410	400
1	400	420	450	460	1020	400	420	850	400	420	450
2	450	430	400	760	460	450	430	1000	450	430	400
3	250	280	500	290	560	250	280	500	250	280	500
5	350	400	600	510	760	350	400	600	350	400	600
8	500	500	900	920	890	500	500	900	500	500	900
English											
SAE Wire Size No.	SAE Cable Type										
	TWP in	GPT in	HDT in	STS in	HTS In	TXL in	GXL in	SXL in	TWE in	GTE in	HTE in
24	9					9			9		
22	10					10			10		
20	12	16	14	18	30	12	16	22	12	16	14
18	14	16	16	21	35	14	16	28	14	16	16
16	16	17	18	22	40	16	17	33	16	17	18
14	18	17	16	30	18	18	17	39	18	17	16
12	10	11	20	11	22	10	11	20	10	11	20
10	14	16	24	20	30	14	16	24	14	16	24
8	20	20	35	36	35	20	20	35	20	20	35
Note: English units are not direct conversions from metric.											

FIGURE 14—MINIMUM SANDPAPER ABRASION RESISTANCE REFERENCE 6.10

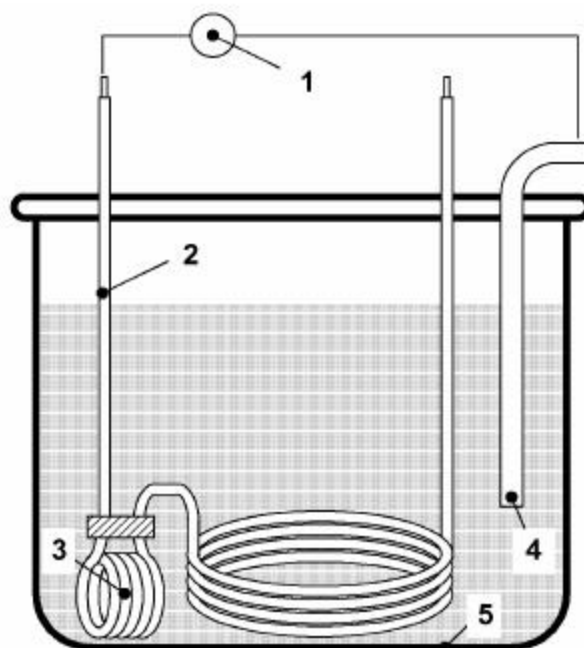
6.11 Crosslinking—25 mm (1 in) of insulation shall be removed from each end of a 600 mm (24 in) sample of finished cable. The sample shall be bent a minimum of 135 degrees around a 6 mm (1/4 in) mandrel. The cable and mandrel shall be placed against a hot plate at least 150 mm by 150 mm (6.0 in by 6.0 in) which has been preheated to $250\text{ }^{\circ}\text{C} \pm 25\text{ }^{\circ}\text{C}$. A force of 5 to 7 N (1 to 1.5 lb) shall be applied for 5 to 6 s without rubbing or scraping the cable on the plate. After exposure, the cable conductor shall not be visible through the insulation. If the visual inspection is not conclusive, the sample is to be returned to room temperature and then subjected to a dielectric test similar to that specified in 6.4. However, the immersion time and application of the voltage shall be 1 min.

6.12 Strip Force—The usage of this test will be established by agreement between customer and supplier. Prepare a test sample of finished cable which is 75 mm (3 in) in length. 25 mm (1 in) of insulation shall be cleanly cut and carefully stripped from one end of the conductor. Care must be taken not to disturb the $50\text{ mm} \pm 2\text{ mm}$ ($2\text{ in} \pm 0.08\text{ in}$) section when removing the residual insulation. No burrs are permitted on the ends of the metallic conductor. Insert the stripped end through a plate with an appropriate diameter hole. The conductor shall be pulled through the plate at a rate of 500 mm/min (20 in/min). The maximum force shall be recorded. A minimum of four readings shall be obtained. The mean of all readings shall determine the strip force of the cable under test. The requirements for the "Strip Force" test, if any, will be established by agreement between the supplier and the customer.

6.12.1 ALTERNATIVE—A $25\text{ mm} \pm 2\text{ mm}$ ($1\text{ in} \pm 0.08\text{ in}$) sample of undisturbed insulation may be used.

6.13 Hot Water Resistance—This test is for initial qualification only. The usage of this test will be established by agreement between customer and supplier. At least one wire size shall be tested; however, for comparative purposes 0.8 mm^2 (No. 18) is preferred. 25 mm (1 in) of insulation shall be removed from each end of two $2.5\text{ m} \pm 0.1\text{ m}$ ($100\text{ in} \pm 4\text{ in}$) test samples of finished cable. Other test sample lengths may be used; however, in case of a dispute, the referee method shall use the 2.5 m test sample length. Closely wind a minimum of three complete turns of the first test sample around a mandrel 5 times the diameter of the test sample and secure the coil as shown in Figure 15." Immerse the first test sample in a saltwater bath with 10 g/L of NaCl in distilled water at $85\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$. To avoid interaction between compounds, test samples with different insulating compounds shall not be tested in the same bath. Also, a virgin saltwater bath shall be used for each test. Connect one end of the first test sample to the positive terminal of a 48 V DC power source. Connect the negative terminal to the copper electrode in the bath. After 7 days, disconnect the 48 V DC power source, measure the insulation resistance, and calculate the "Insulation Volume Resistivity" (see 6.14). This completes one cycle. Repeat this procedure for a total of five cycles, 35 days. After conditioning, remove the test sample from the bath, allow it to cool to room temperature, and make a visual inspection of the insulation. Ignore any damage caused by the tie, which secures the coils. If no exposed conductor is visible, perform the "Dielectric" test (see 6.4) except the voltage will be applied after immersion in the salt solution for a minimum of 10 min.

Perform the entire procedure for the second test sample with the polarity of the 48 V DC power source reversed.



Key:

- 1 48 V DC Power Source
- 2 Test Sample
- 3 Closely Wound Turns of Test Sample
- 4 Copper Electrode
- 5 Non-Conductive Vessel

FIGURE 15—APPARATUS FOR HOT WATER RESISTANCE TEST REFERENCE 6.13

6.14 Insulation Volume Resistivity—This test is only used as part of the “Hot Water Resistance” test (see 6.13). While still in the saltwater bath connect the sample to a resistance measuring device with a DC voltage of 500V. Voltages between 100 V and 500 V are allowed, however, in case of a dispute, the referee apparatus shall be a resistance measuring device with a DC voltage of 500 V. The insulation resistance shall be measured 1 min after application of the voltage or after it reaches equilibrium, whichever comes last. Calculate the “Insulation Volume Resistivity” using the following formula:

$$\rho_0 = 2.725 \frac{LR}{\log \frac{D}{d}} \quad (\text{Eq. 1})$$

where:

ρ_0 is the “Insulation Volume Resistivity”, expressed in $\Omega \cdot \text{mm}$
 L is the immersed length of the test sample, expressed in mm
 R is the measured insulation resistance, expressed in Ω
 D is the outside cable diameter, in accordance with 5.3, expressed in mm
 d is the conductor diameter, expressed in mm
 log is log to the base 10

The “Insulation Volume Resistivity” shall not be less than $10^9 \Omega \cdot \text{mm}$.

6.15 Environmental Cycling—This test is for initial qualification only. The usage of this test will be established by agreement between customer and supplier. At least one wire size shall be tested; however, for comparative purposes 0.8 mm² (No. 18) is preferred. 25 mm (1 in) of insulation shall be removed from each end of two 600mm (24 in) samples of finished cable. Wind a minimum of 3 turns for wire sizes ≤ 1 mm² and 2 turns for wire sizes > 1 mm² around a mandrel 1.5 times $\pm$ 0.3 times the diameter of the sample at a uniform rate of one turn in 10 s and secure the ends. Condition the sample according to the temperature and relative humidity shown in Figure 16. The “Temperature Class Rating” is shown in Figure 5. The cycle begins with the sample at $-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and $5\% \pm 5\%$ relative humidity. Completion of the schedule shown in Figure 16 will constitute one cycle. Repeat the cycle for a total of 40 cycles. While still on the mandrel, remove the test sample from the chamber, allow it to cool at room temperature for 30 min, and unwind it from the mandrel. Make a visual inspection of the insulation. Ignore any damage caused by the ties, which secure the ends. If no exposed conductor is visible, perform the “Dielectric” test (see 6.4) except the voltage will be applied after immersion in the salt solution for a minimum of 10 min.

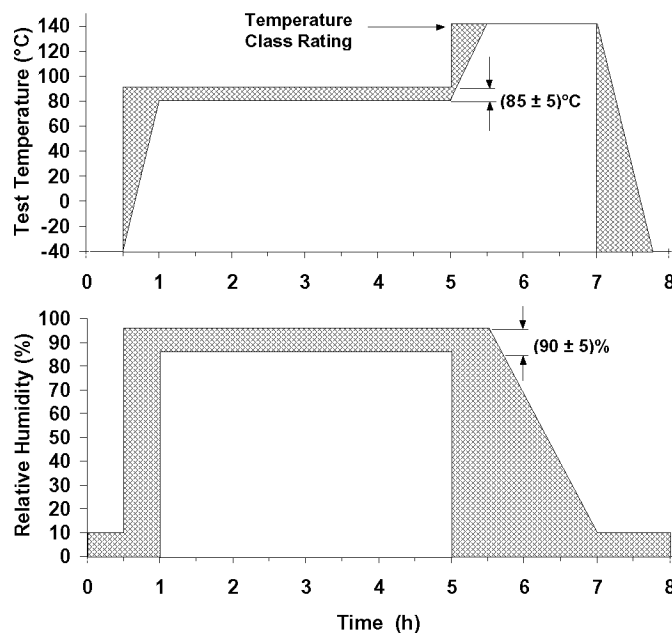


FIGURE 16—PROCEDURE FOR ENVIRONMENTAL CYCLING TEST REFERENCE 6.15

7. Reference Information

7.1 Color Code—The purpose of the “color code” is to provide visual information during the building and servicing of wiring assemblies. Cables of different colors shall be distinguishable from each other.

7.1.1 RECOMMENDED COLORS—The color of the cable should match as closely as possible the central color specified in Appendix B. The “Light” and “Dark” color limits are for guidelines only.

7.1.2 STRIPES—When additional color coding is required, various colored stripes may be applied longitudinally, spirally, or by other manner agreed upon by the supplier and user. The color standards do not apply to stripes.

8. Notes

- 8.1 Marginal Indicia**—The change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

PREPARED BY THE SAE CABLE TASK FORCE OF THE
SAE ELECTRICAL DISTRIBUTION SYSTEMS STANDARDS COMMITTEE

APPENDIX A

FOR INFORMATION ONLY
 OUTSIDE DIAMETER AND MINIMUM WALL THICKNESS
 ENGLISH UNITS
 REFERENCE 5.3 AND 5.4

SAE Wire Size	SAE Cable Type											
	TWP TWE TXL			GPT GTE GXL			STS SXL			HDT HTE HTS		
	Wall Thickness Nominal	Minimum	Maximum OD	Wall Thickness Nominal	Minimum	Maximum OD	Wall Thickness Nominal	Minimum	Maximum OD	Wall Thickness Nominal	Minimum	Maximum OD
No.	in	in	in	in	in	in	in	in	in	in	in	in
24	0.016	0.011	0.062									
22	0.016	0.011	0.069									
20	0.016	0.011	0.076	0.023	0.016	0.095	0.029	0.020	0.110	0.036	0.025	0.125
18	0.016	0.011	0.084	0.023	0.016	0.100	0.030	0.021	0.120	0.037	0.026	0.135
16	0.016	0.011	0.095	0.023	0.016	0.115	0.032	0.022	0.135	0.040	0.028	0.150
14	0.016	0.011	0.109	0.023	0.016	0.125	0.035	0.025	0.155	0.041	0.029	0.165
12	0.018	0.013	0.132	0.026	0.018	0.150	0.037	0.026	0.180	0.046	0.032	0.200
10	0.020	0.014	0.161	0.031	0.022	0.185	0.041	0.029	0.210	0.046	0.032	0.255
8	0.022	0.015	0.196	0.037	0.026	0.235	0.043	0.030	0.245	0.055	0.039	0.280

Note:
English units for dimensions are included for information purposes only. They do not constitute a requirement for this standard.

FIGURE A1—OUTSIDE DIAMETER AND MINIMUM WALL THICKNESS—
 ENGLISH UNITS (REFERENCE 5.3 AND 5.4)

APPENDIX B

RECOMMENDED COLORS REF SAE EA-1128, WIRE COLOR CHARTS

Color	Light	Central	Dark
Red Orange Brown	2.5R 4.2/11.2 8.75R 6.0/11.5 10R 3.5/1.0	3.3R 3.8/11.0 8.75R 5.75/12.5 0.8YR 3.0/1.0	4.4R 3.4/10.4 8.75R 5.5/13.5 4.6YR 2.5/1.0
Tan Yellow Lt Green	5YR 6.25/4.0 8.4Y 8.5/8.3 0.5G 6.25/6.3	5YR 5.9/4.3 8.2Y 8.5/9.8 0.5G 5.6/7.0	5YR 5.5/4.6 8Y 8.5/11.2 0.5G 5.1/7.5
Dk Green Lt Blue Dk Blue	2.2BG 4.75/9.4 9B 5.4/5.0 4.6PB 3.8/10.2	1.3BG 4.25/9.4 9B 5.0/5.0 5.2PB 3.3/9.8	0.5BG 3.75/9.4 9B 4.7/5.0 5.6PB 2.75/9.4
Purple Pink Gray	4.4P 3.9/6.7 7RP 6.1/11.5 N6.3/(10GY,0.2)	3.9P 3.4/6.7 7.2RP 5.6/12.1 N5.7/(10GY,0.2)	3.4P 2.8/6.7 7.7RP 5.2/12.5 N5.2/(10GY,0.2)
White Black	Not Applicable N3	5Y 9/1 N 2.25	5Y 8.5/1 Not Applicable

Notes:

1. Comparison must be made by a person with normal color sensitivity, under cool white fluorescent lighting. The surface being inspected and the tolerance set must be in the same plane. Cable samples must be placed flat, overlapping the color standard.
2. FMII, measured under CIE illuminant C, 2 deg observer.
3. The "Light" and "Dark" color limits are for guidelines only.

FIGURE B1—RECOMMENDED COLORS REFERENCE AE EA-1128, WIRE COLOR CHARTS

APPENDIX C

SOURCES FOR SAE REFERENCE MATERIALS

Fluid	Supplier	Packaging
Engine Oil ASTM D471 IRM 902 Oil	R. E. Carol, Inc. P. O. Box 5806 Trenton, NJ 08638-0806 Contact: Customer Service Phone: (800)-257-9365 Fax: (609)-695-0102	5 Gal Can
	Penreco 4426 East Washington Blvd. Los Angeles, CA 90023 Phone: (213)-268-4271 Fax: (213)-268-7972	5 Gal Can
Power Steering ASTM D471 IRM 903 Oil	R. E. Carol, Inc. P. O. Box 5806 Trenton, NJ 08638-0806 Contact: Customer Service Phone: (800)-257-9365 Fax: (609)-695-0102	5 Gal Can
	Penreco 4426 East Washington Blvd. Los Angeles, CA 90023 Phone: (213)-268-4271 Fax: (213)-268-7972	5 Gal Can
Automatic Trans Fluid SAE J311 Citgo Part No. 33123	Citgo Petroleum 699 Heights Rd. Lake Orion, MI 48362 Contact: Dave LaRocca Phone: (800)-331-4068	55 Gal Drum or Quart
Kester #2164 Flux	Kester Solder 515 East Touhy Avenue Des Plaines, IL 60018-2675 Contact: Julie Courtney Phone: (847) 699-4628 Fax: (847) 699-5548	Pint Quart or Gallon
Sandpaper Abrasion Tape	Glowe-Smith Industrial, Inc. 812 Youngstown Kingsville Rd. Vienna, Ohio 44473 Contact: Terry Dillman Phone: (330) 539-5085 Fax: (330) 539-7750	Single Roll ≥ 2 Rolls ≥ 6 Rolls ≥ 11 Rolls ≥ 51 Rolls

FIGURE C1—SOURCES FOR SAE REFERENCE MATERIALS

SAE J1128 Revised MAY2000

Rationale—This document is being revised to include the following:

- a. The maximum system voltage is being changed to 60 V DC (25 V AC).
- b. A “Definitions” clause is being added.
- c. An additional fluid is being added to the “Fluid Compatibility” clause.
- d. “Hot Water Resistance” and “Environmental Cycling” tests are being added.
- e. Revised Color Code section to clarify reason for color code and the use of the limits as guidelines.
- f. Move text out of figure drawings and into legends.

Relationship of SAE Standard to ISO Standard—Not applicable.

Application—This SAE Standard covers low tension primary cable intended for use at a nominal system voltage of 60 V DC (25 V AC) or less in surface vehicle electrical systems. The tests are intended to qualify cables for normal applications with limited exposure to fluids and physical abuse.

Reference Section

SAE J156—Fusible Links

SAE J311—Fluid for Passenger Car Type Automatic Transmission

SAE J1067—Seven Conductor Jacketed Cable for Truck Trailer Connections

SAE J1127—Low Tension Battery Cable

SAE J1292—Automobile, Truck, Truck-Tractor, Trailer, And Motor Coach Wiring

SAE J1654—High Voltage Primary Cable

SAE J1673—High Voltage Automotive Wiring

SAE J1678—Ultra Thin Wall Primary Cable

SAE J2183—60 V and 600 V single core cables - Test methods, dimensions and requirements

SAE J2501—Round, unscreened, 60 V and 600 V multicore sheathed cables - Basic and high performance test methods and requirements

SAE EA-1128—Wire Color Charts

SAE Dictionary of Materials and Testing

ASTM B 1—Standard Specification for Hard-Drawn Copper Wire

ASTM B 3—Standard Specification for Soft or Annealed Copper Wire

ASTM B 8—Concentric-Lay-Stranded Copper conductors, Hard, Medium-Hard, or Soft

ASTM B 33—Standard Specification for Tinned Soft or Annealed Copper Wire

ASTM B 174—Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors

ASTM B 263—Method for Determination of Cross-Sectional Area of Standard Conductors

SAE J1128 Revised MAY2000

ASTM B 298—Standard Specification for Silver-Coated Soft or Annealed Copper Wire

ASTM B 354—Definitions of Terms Relating to Uninsulated Metallic Electrical Conductors

ASTM B 355—Standard Specification for Nickel-Coated Soft or Annealed Copper Wire

ASTM B 452—Standard Specification for Copper-Clad Steel Wire for Electronic Application

ASTM B 787—19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation

ASTMD412—Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension

ASTM D 471—Standard Test Method for Rubber Property – Effect of Liquids

ASTM D 573—Standard Test Method for Rubber - Deterioration in an Air Oven

ASTM E 145—Standard Specification for Gravity-Convection and Forced-Ventilation Ovens

ASTMF1251—Standard Terminology Relating to Polymeric Biomaterials in Medical and Surgical Device

IEC 811-2-1—Common test methods for insulating and sheathing materials of electrical cables—Part 2: Methods specific to elastomeric compounds—Section 1: Ozone resistance test—Hot set test—Mineral oil immersion test.

IEC, Electricity, Electronics and Telecommunications, Multilingual Dictionary

IRM 902

ISO6722—Road vehicles—60 V and 600 V single core cables—Test methods, dimensions and requirements

ISO14572—Road vehicles—Round, unscreened, 60 V and 600 V multicore sheathed cables—Basic and high performance test methods and requirements

Developed by the SAE Cable Task Force

Sponsored by the SAE Electrical Distribution Systems Standards Committee