AEROSPACE STANDARD	AS6070	
	Issued 2015-01	
Aerospace Cable, High Speed Data, Copper		

RATIONALE

Establish a standard for Qualification by Certification of aerospace high speed data cables.

1. SCOPE

1.1 Purpose

This standard covers jacketed multi-conductor copper data cables for aerospace usage.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AS4373	Test Methods for Insulated Electric Wire
AS5768	Tool, Stripper, Electrical Insulation, General Specification For
AS5768/1	Tool, Stripper, Manually Actuated, Electrical Insulation, Round Wire, Size 10 to 30
AS5768/2	Tool, Stripper, Manually Actuated, Small Grip, Electrical Insulation, Round Wire, Size 16 to 30
AS6070/1	Cable, High Speed Data Quad, 24 AWG Copper Alloy, 100 Ohm, 200 °C, Ethernet 10/100 Base T
AS6070/2	Cable, 4 Pair 24 AWG Copper Alloy, Shielded, 100 Ohm, 200 °C, Ethernet 1000 Base T
AS6070/3	Cable, High Speed Data Quad, 24 AWG Copper Alloy, 110 Ohm, 200 °C

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
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SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AS6070

AS6070/4 Cable, 4 Pair 24 AWG Copper Alloy, Shielded, 100 Ohm, 150 °C, Ethernet 1000 Base T

AS9100 Quality Management Systems - Requirements for Aviation, Space and Defense Organizations

AS29606 Wire, Electrical, Stranded, Uninsulated Copper, Copper Alloy, or Aluminum, or Thermocouple Extension, General Specification For

2.1.2 U.S. Government Publications

Copies of these documents are available online at http://quicksearch.dla.mil.

MIL-STD-104 Limit for Electrical Insulation Color

MIL-STD-202 Test Method Standard - Electronic and Electrical Component Parts

SD6 Provisions Governing Qualification

2.1.3 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 B298 Standard Specification for Silver Coated Soft or Annealed Copper Wire

ASTM D3032 Hookup Wire Insulation, Standard Methods of Testing

ASTM D4566 Standard Test Methods for Electrical Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable

2.1.4 National Conference of Standards Laboratories (NCSL) Publications

Available from NCSL International, 2995 Wilderness Place, Suite 107, Boulder, CO 80301, Tel: 303-440-3339, www.ncsli.org.

NCSL Z540.3 Requirement for the Calibration of Measuring Test Equipment

2.1.5 Electronic Components Industry Association (ECIA) Publications

Available from Electronic Components Industry Association, 2214 Rock Hill Road, Suite 265, Herndon, VA 20170, Tel: 571-323-0294, www.ecianow.org.

ECA EIA-364-108 Impedance, Reflection Coefficient, Return Loss, and VSWR measured in the Time and Frequency Domain Test Procedure for Electronic Connector, Sockets, Cable Assemblies or Interconnect Systems

2.1.6 Institute of Electrical and Electronic Engineers (IEEE) Publications

Available from IEEE Operations Center, 445 and 501 Hoes Lane, Piscataway, NJ 08854-4141, Tel: 732-981-0060, www.ieee.org.

IEEE 1394 Standard for a High Speed Serial Bus

2.2 Definitions

ATTENUATION: The degradation of signal amplitude along a cable length due to losses in the cable. Attenuation (dB) = 20 log (V1/V2).

ATTENUATION TO CROSSTALK RATIO-FAR END (ACR-F): (Formally known as EQUAL LEVEL FAR END CROSSTALK, ELFEXT): A measure of far end crosstalk which accounts for the effects of cable attenuation.

BANDWIDTH: The range of electrical frequencies that a transmission line can effectively handle. The maximum data rate for a given system. (See Attenuation to Crosstalk Ratio)

CAPACITANCE, MUTUAL: The capacitance between two conductors of a pair with all other conductors and shield grounded.

CAPACITANCE, UNBALANCE: A measure of the inequality of capacitance between conductors of two adjacent pairs.

CAPACITANCE, UNBALANCE TO GROUND: A measure of the inequality of capacitance between the ground capacitance of two conductors of a single pair.

CATEGORY 5: A 4-pair cable with transmission characteristics specified up to 100 MHz.

CATEGORY 5e: A 4-pair cable with transmission characteristics specified up to 100 MHz. Tests in addition to those for Category 5 are added to ensure the capability to handle Gigabit Ethernet.

CHARACTERISTIC IMPEDANCE: The measure of a transmission line's curve fit of the input impedance throughout its length at a specific frequency, or over a swept frequency spectrum. Additionally, characteristic impedance can be defined in the time domain where the rise time of the TDR pulse is defined.

COMMON MODE VOLTAGE: In a differential system, the unwanted voltage between each input connection and ground that is added to the voltage of each original signal.

CROSSTALK: The noise induced into a passive pair by an active pair measured in dB. Crosstalk measured from the near end is "NEXT" and from the far end is "FEXT".

DELAY SKEW: The difference in propagation delay between the slowest and fastest pairs in a cable.

DIFFERENTIAL IMPEDANCE: The impedance between the inverting and non-inverting input terminals of a differential amplifier.

DIRECT CURRENT RESISTANCE (DCR) UNBALANCE: The percent difference of DCR between the two conductors of any pair compared to the others.

FAR END CROSSTALK (FEXT): The noise induced into a passive pair by an active pair and measured at the far end.

GIGABIT Ethernet: Ethernet networking that supports a data rate of 1 Gigabit per second.

IMPEDANCE: The complex opposition to current flow in a transmission line which includes the components of resistance, capacitance and inductance when driven by a voltage source.

INSERTION LOSS: The signal loss resulting from the insertion of a component between a transmitter and a receiver. (Often referred to as attenuation.)

NEAR END CROSSTALK (NEXT): The noise induced into a passive pair by an active pair and measured at the near end.

POWER SUM: A computation of the total effects of the disturbance to a single pair from all other pairs in a cable.

POWER SUM ATTENUATION TO CROSSTALK RATIO-FAR END (PSACR-F): (Formally known as POWER SUM EQUAL LEVEL FAR-END CROSS TALK, PSELFEXT): A computation of the ratio of noise induced into a single pair by all other pairs measured at the far end relative to the received signal on the same pair.

POWER SUM NEAR END CROSSTALK (PSNEXT): A computation of the noise induced into a single pair by all other pairs and measured at the near end.

TIME DELAY (Td): The time it takes for a signal to propagate from one end of a pair to the opposite end of the same pair.

PROPAGATION DELAY SKEW: The time difference in propagation delay from the fastest pair to the slowest.

QUAD: A cable consisting of four separate insulated conductors in which each set of opposing conductors constitutes a differential pair.

QUALIFICATION INSPECTION: Qualification Inspection is a process that demonstrates that a component is capable of fully conforming to all the requirements defined in a standard. Qualification Inspection includes definition of the measurements, tests, analysis, and associated data which provides consistent rationale for acceptance of a particular supplier's design as meeting the standard requirements typically prior to acquisition by the Purchaser.

QUALIFIED PRODUCTS LIST: A Qualified Products List is a list of suppliers whose products have been evaluated to a defined process and who are authorized to provide those products to a purchaser upon request. When a Qualified Products List is specified, only approved suppliers are authorized to provide products under the part number defined in the component standard. A Qualified Products List is established by a Qualifying Activity.

QUALIFYING ACTIVITY: A Qualifying Activity is a function established by a Purchaser or group of Purchasers that has a defined process used to consistently evaluate all suppliers' products in accordance with the component standard.

QUALITY CONFORMANCE INSPECTION: Quality Conformance Inspection is a process which includes measurements, non-destructive tests, analysis and associated data that will provide verification that a particular individual component continually conforms to the requirements defined in the standard.

PURCHASER: A Purchaser is an individual or group of individuals that can issue a purchase order.

RETURN LOSS (RL): A measure of the ratio of a transmitted signal relative to the reflected signal caused by imperfections and inconsistencies in a transmission line, and is related to input impedance.

SUPPLIER: A Supplier is a manufacturer which has design and production control of the processes used to produce a component.

TWINAX: Cable consisting of two insulated conductors surrounded by an overall shield.

VELOCITY OF PROPAGATION (Vp): The transmission speed of an electrical signal down a length of cable compared to its speed in free space expressed in percentage.

3. REQUIREMENTS

3.1 Detailed Specification Sheets

Individual cable requirements shall be as specified herein and in accordance with the applicable detailed specification sheets. In the event of any conflict between the requirements of this standard and the detailed specification sheet, the latter shall govern.

3.2 Qualification

The components shall be a product that has been tested and has passed the qualification tests specified herein, and has been listed on or approved for listing on the applicable qualification products list.

3.3 Physical Characteristics

3.3.1 Construction Description

The multi-conductor cable dimensions and material make up shall be as specified in the applicable detailed specification sheets and measured in accordance with 5.1.1.

3.3.2 Primary Wire and Jacket Color

Unless otherwise specified in the detail specification sheets, the color of the insulation shall be in accordance with MIL-STD-104, Class 1 or shall meet alternate Munsell color limits as specified in Table 1. Alternate Munsell color limits may also be used for laser marking, or transparent jackets, when specified in the detail specification and measured in accordance with 5.1.2.

Table 1 - Alternate Munsell color limits for primary wires and jackets*

COLOR	HUE		VALUE		CHROMA	
	FROM	TO	FROM	TO	FROM	TO
BLACK	2.5N	2.5N	7	8.5	N/A	N/A
BLUE	5PB	7.5B	7	8	4	6
GREEN	2.5G	7.5G	7	9	2	6
RED	10RP	5R	7	8	4	6
YELLOW	5Y	10Y	8	9	4	6
BROWN	2.5YR	7.5R	7	9	2	4
ORANGE	10R	2.5YR	6	7	8	10
VIOLET	2.5P	7.5R	7	8	4	8
GRAY	SAME AS BLACK		SAME AS BLACK		SAME AS BLACK	

*Alternate Munsell color limits are proposed to limit the concentration of color additives which may affect, in some particular cases, performances of the cables in transmission.

3.3.3 Cable Diameter

The outer jacket diameter shall be as specified in the applicable detailed specification sheets and measured in accordance with 5.1.3.

3.3.4 Cable Weight

The maximum cable weight shall be as specified in the applicable detailed specification sheets and measured in accordance with 5.1.4.

3.3.5 Conductors

In accordance with AS29606 Table 4C unless otherwise specified, and measured in accordance with 5.1.5.

3.3.6 Conductor Plating

Per AS29606 Type SCA or SCA1, unless otherwise specified in the detail specification, and measured in accordance with 5.1.6 prior to processing.

3.4 Electrical Requirements

3.4.1 Attenuation

The maximum attenuation shall be as specified in the detailed specification sheets and shall be measured in accordance with 5.2.1.

3.4.2 Impedance

Impedance shall be tested in accordance with the following methods:

3.4.2.1 Characteristic impedance, when specified, shall be as specified in the detailed specification sheets and shall be measured in accordance with 5.2.2.

3.4.2.2 Differential Impedance, when specified, shall be as specified in the detailed specification sheets and shall be measured in accordance with 5.2.3.

3.4.3 Capacitance, Mutual

Mutual Capacitance shall be as specified in the detailed specification sheets and shall be measured in accordance with 5.2.4.

3.4.4 Capacitance, Unbalanced- Pair to Ground

Capacitance Unbalanced, pair to ground shall be specified in the detailed specification sheets and shall be measured in accordance with 5.2.5.

3.4.5 Direct Current Resistance Unbalanced

Conductor DCR Unbalanced shall be as specified in the detailed specification sheet and shall be measured in accordance with 5.2.6.

3.4.6 Near End Cross Talk (NEXT)

The minimum NEXT shall be as specified in the detailed specification sheets and shall be measured in accordance with 5.2.7.

3.4.7 Near End Cross Talk (NEXT) on Mandrel

The minimum NEXT shall be as specified in the detailed specification sheets and shall be measured in accordance with 5.2.8.

3.4.8 Power Sum Near End Cross Talk (PS-NEXT)

PS-NEXT, when specified, shall meet the requirements of the detailed specification sheets and shall be determined in accordance with 5.2.9.

3.4.9 Attenuation to Crosstalk Ratio-Far End (ACR-F)

ACR-F, when specified, shall meet the requirements of the detailed specification sheets and shall be determined in accordance with 5.2.10.

3.4.10 Power Sum Attenuation to Crosstalk Ratio-Far End (PSACR-F)

PSACR-F, when specified, shall meet the requirements of the detailed specification sheets and shall be determined in accordance with 5.2.11.

3.4.11 Return Loss

Return Loss (RL), when specified, shall meet the requirements of the detailed specification sheets and shall be measured in accordance with 5.2.12.

3.4.12 Propagation Delay (see ASTM D4566, Phase Delay)

Propagation Delay, when specified, shall meet the requirements of the detailed specification sheets and shall be measured in accordance with 5.2.13.

3.4.13 Propagation Delay Skew (see ASTM D4566, Phase Delay)

Propagation Delay Skew, when specified, shall meet the requirements of the detailed specification sheets and shall be determined in accordance with 5.2.14.

3.4.14 Velocity of Propagation (Vp) (see ASTM D4566, Phase Velocity)

Velocity of Propagation, when specified, shall meet the requirements of the detailed specification sheets and shall be measured in accordance with 5.2.15.

3.4.15 Dielectric Withstand - Dry

Dielectric Withstand - Dry shall meet the minimum requirements of the detailed specification sheets and shall be tested in accordance with 5.2.16.1.

3.4.16 Dielectric Withstand - Wet

Dielectric Withstand - Wet shall meet the minimum requirements of the detailed specification sheets and shall be tested in accordance with 5.2.16.2.

3.4.17 Spark Test (Primary Wires)

Spark Test on primary wire shall meet the minimum requirements of the detailed specification sheets and shall be tested in accordance with 5.2.17.

3.4.18 Spark Test (Finished Cable)

Spark Test on finished cable shall meet the minimum requirements of the detailed specification sheets and shall be tested in accordance with 5.2.18.

3.5 Environmental Requirements

3.5.1 Life Cycle

Life Cycle shall meet the minimum requirements of the detailed specification sheets and shall be tested in accordance with 5.3.1.

3.5.2 Fluid Immersion

Results of Fluid Immersion shall meet the minimum requirements of the detailed specification sheets and shall be tested in accordance with 5.3.2.

3.5.3 Humidity Resistance

Humidity Resistance shall meet the requirements of the detailed specification sheets and shall be tested in accordance with 5.3.3.

3.5.4 Blocking

Using a mandrel 10 times the cable diameter shall meet the requirements of the detailed specification sheets and shall be tested in accordance with 5.3.4 (component wires only).

3.6 Mechanical Requirements

3.6.1 Cold Bend

Using a mandrel 10 times the cable diameter shall meet the requirements of the detailed specification sheets and shall be tested in accordance with 5.4.1.

3.6.2 Conductor Tensile and Elongation

Conductor Tensile and Elongation shall meet the requirements of AS29606 unless otherwise specified, and shall be measured in accordance with 5.4.2 prior to processing.

3.6.3 Wrinkle

Shall meet the requirements of the detailed specification sheets and shall be tested in accordance with 5.4.3.

3.6.4 Bend Test

Bend testing shall meet the requirements of the detailed specification sheets and shall be tested in accordance with 5.4.4.

3.6.5 Insulation Stripping

All insulation on conductors shall be readily removable by conventional wire stripping devices. Insulation and conductor shall be "acceptable" in accordance with AS5768.

3.6.6 Stripability

The jacket shall be removable from the finished cable without adherence to the underlying shield or cable.

3.7 Thermal Requirements

3.7.1 Flammability

Flammability shall meet to the requirements of the detailed specification sheets and shall be tested in accordance with 5.5.1.

3.7.2 Thermal Shock

Thermal shock shall meet the requirements of the detailed specification sheets and shall be tested in accordance with 5.5.2.

3.7.3 Smoke Quantity

Smoke quantity shall meet the requirements of the detailed specification sheets and shall be tested in accordance with 5.5.3.

3.8 Identification Marking

The finished cable shall be identified by marking applied to the outer surface of the cable or visible through the outer surface and repeated at 6 inch intervals. The identification shall consist of the following information:

a. Complete Standard Part Number as specified in the specification sheet (i.e., AS6070/1-0A0X)

b. Manufacturer's CAGE code

3.8.1 Durability of Identification Marking

The durability of identification marking shall meet the requirements of the applicable detailed specification sheets and tested in accordance with 5.5.4 Test shall not be required when the identification marking is under a translucent jacket.

3.8.2 Contrast (Jacket)

If the identification is applied by a laser, the minimum contrast requirements are defined per the detailed specification sheet and tested in accordance with 5.5.5.

3.9 Workmanship

All details of workmanship shall be in accordance with high quality aerospace manufacturing practices. The jacket shall be free of foreign materials and irregularities such as cracks, splits and bubbles. Color shall be uniform and free of mottling and streaking.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

Unless otherwise specified herein, the contract or purchase order, the supplier is responsible for the performance of all contract inspection requirements. Except as otherwise specified herein, the contract or purchase order, the supplier may use any facilities suitable for the performance of the inspection requirements. The Qualifying Activity has the right to perform any of the inspections set forth in the standard where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for Compliance

All items must meet all technical requirements of the product standard. The inspection set forth in this standard shall become a part of the supplier's overall inspection system or quality program. The absence of any inspection requirements in the standard shall not relieve the supplier of the responsibility of assuring that all products comply with all requirements of the contract or purchase order. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the purchaser to acceptance of defective material.

4.1.2 Test Equipment and Inspection Facilities

Test and measuring equipment and inspection facilities of sufficient accuracy, quality and quantity to permit performance of the required a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with NCSL Z540.3 or equivalent standards.

4.1.3 Quality Assurance Program

The supplier's reliability assurance program for AS6070 aerospace cables and assembly procedures shall comply with the AS9100 Aerospace standard for Quality Management System requirements. Other established and industry recognized quality assurance standards that assure all products produced conform to the contract requirements are acceptable. However, if used, it is the responsibility of the supplier to provide evidence of compliance to AS9100. The Qualifying Activity (QA) authority reserves the right to monitor, measure, and validate compliance at their discretion.

4.2 Classification of Inspection

The inspections specified herein are classified as follows:

a. Initial Qualification Inspection by Certification (see 4.4)

b. Retention of Qualification Inspection by certification (see 4.5)

c. Quality Conformance Inspections (see 4.6)

4.2.1 Inspection Conditions

All inspections shall be performed in accordance with the test conditions specified in applicable paragraphs and all test data shall be compiled in accordance with an acceptable method, such as chapter 4 of SD-6.

4.3 Materials Inspection

Materials inspection shall consist of certification supported by verifying data that materials used in fabricating the delivered cable are in accordance with the requirements of 3.1.

4.4 Initial Qualification by Certification Inspection

Qualification consists of all the applicable examination and tests as specified in Table 2, however some level of qualification by certification may be considered by the Qualifying Activity, but in all cases the Qualifying Activity shall perform the tests specified. A request for qualification by certification shall be made to the Qualifying Activity if the manufacturer considers it appropriate (see 7.2.1). The request shall include justification for qualification by certification such as previous testing on identical/similar products, current qualification status on similar products, or other types of similar technical justification. The request shall also include a recommendation to indicate the extent of the certification, including recommended testing and qualification program oversight that is being proposed for certification. The Qualifying Activity will make the determination for the extent of qualification by certification to be allowed. The Qualifying Activity shall require the supplier to sign a certification form to document the appropriate part numbers for QPL listing (see 7.2.2). The Qualifying Activity shall only approve components by the SAE part numbers defined herein. The Qualifying Activity has the authority to impose specific specification test requirements to resolve test failures/discrepancies. The supplier shall not make any changes in process control inspections, quality conformance inspections, or manufacturing control drawings (editorial changes are acceptable) without the express approval of the supplier's quality assurance.

4.4.1 Qualification Samples

A sample of two specimens of each product part number shall be tested as specified in Table 2. Sequence testing is not required, but the sample shall be subjected to all tests. The supplier shall, for each sample, use the same ingredients, manufacturing procedures and methods of inspection as would be used to provide the product to a purchaser's contract.

4.4.1.1 Qualification inspection shall be performed on sample units produced with equipment and procedures normally used in production. Qualification samples shall be from a single production run for each standard type submitted.

4.5 Retention of Qualification by Certification Inspection

Retention of qualification by certification inspection shall occur every 36 months after the initial qualification date. Unless there is a known issue provided by a purchaser, the qualifying activity shall only impose the quality conformance requirements (see 4.6) and the designated qualifying activity verification tests of Table 2. The qualifying activity shall require a summary of the quality conformance results showing the total number cables that passed or failed that occur during the reporting period. If needed, the quality assurance results may be used for retention of qualification tests as applicable. Any change in the supplier's manufacturing control drawings (editorial changes are acceptable) that required additional testing shall also be included in the report.

4.5.1 Noncompliance

If a sample fails any inspection test, the supplier shall take corrective action on the materials or processes, or both, as warranted. Corrective reports for all failures shall be submitted to the qualifying activity with the qualification report. Additional tests may be requested by qualifying activity prior to final approval.

4.6 Quality Conformance Inspection

Quality conformance inspection shall consist of the inspections and tests specified in Table 2. Inspection is required on all production samples.

Table 2 - Qualification and quality conformance testing

Test	Requirement	Test Method	Initial Qualification Tests	Retention of Qualification	Quality Conformance Tests
Physical 1/					
Construction Details	3.3.1	5.1.1	X	X	X
Jacket Color	3.3.2	5.1.2	X	X	X
Cable Diameter	3.3.3	5.1.3	X	X	X
Cable Weight	3.3.4	5.1.4	X	X	X
Conductor	3.3.5	5.1.5	X	X	X
Conductor Plating	3.3.6	5.1.6	X	X	X
Electrical:					
Attenuation	3.4.1	5.2.1	X		X
Characteristic Impedance*	3.4.2.1	5.2.2	X		X
Differential Impedance*	3.4.2.2	5.2.3	X		X
Capacitance (Mutual)*	3.4.3	5.2.4	X		X
Cap Unbalance (PR - Ground)*	3.4.4	5.2.5	X		X
DCR Unbalance*	3.4.5	5.2.6	X		X
NEXT*	3.4.6	5.2.7	X		X
NEXT on Mandrel*	3.4.7	5.2.8	X		
PS-NEXT*	3.4.8	5.2.9	X		X
ACR-F*	3.4.9	5.2.10	X		X
PSACR-F*	3.4.10	5.2.11	X		X
Return Loss*	3.4.11	5.2.12	X		X
Propagation Delay*	3.4.12	5.2.13	X		X
Propagation Delay Skew*	3.4.13	5.2.14	X		X
Velocity of Propagation*	3.4.14	5.2.15	X		X
Dielectric Withstand - Dry	3.4.15	5.2.16.1	X		X
Dielectric Withstand - Wet	3.4.16	5.2.16.2	X		X
Spark Test (primary wires)	3.4.17	5.2.17	X		X
Spark Test (finished cable)	3.4.18	5.2.18	X		X
Environmental:					
Life Cycle 1/	3.5.1	5.3.1	X	X	
Fluid Immersion	3.5.2	5.3.2	X		
Humidity Resistance	3.5.3	5.3.3	X		
Blocking	3.5.4	5.3.4	X		
Mechanical:					
Cold Bend 1/	3.6.1	5.4.1	X	X	
Conductor T&E	3.6.2	5.4.2	X	X	
Wrinkle	3.6.3	5.4.3	X		
Bend Test	3.6.4	5.4.4	X		X
Insulation Stripping	3.6.5	5.4.5	X		X
Thermal:					
Flammability	3.7.1	5.5.1	X		
Thermal Shock	3.7.2	5.5.2	X		X
Smoke Quantity	3.7.3	5.5.3	X		
Identification Marking					
Durability of Marking	3.8.1	5.6.1	X		X
Contrast (Jacket)	3.8.2	5.6.2	X		X

1/ Qualifying activity verification test
* When required by applicable specification sheets

5. TEST METHODS

5.1 Physical Characteristics

5.1.1 Construction Details (see 3.3.1)

Materials are defined in detailed specification sheets. Cable dimensions shall be measured in accordance with AS4373 Method 901.

5.1.2 Jacket Color (see 3.3.2)

Jacket color shall be inspected by visual examination, and in accordance with MIL-STD-104, unless otherwise stated in the detailed specification sheets.

5.1.3 Cable Diameter (see 3.3.3)

The outer jacket dimensions shall be measured in accordance with AS4373 Method 901.

5.1.4 Cable Weight (see 3.3.4)

Cable weight shall be measured in accordance with AS4373 Method 902.

5.2 Electrical Requirements

5.2.1 Attenuation (see 3.4.1)

Attenuation shall be measured in accordance with ASTM D4566.

5.2.2 Characteristic Impedance (see 3.4.2.1)

Characteristic impedance shall be measured in accordance with ASTM D4566, Method 3.

5.2.3 Differential Impedance (see 3.4.2.2)

Differential impedance shall be measured in accordance with ANSI/EIA-364-108, Time Domain Method. The maximum pulse rise time shall be 80 ps.

5.2.4 Capacitance, Mutual (see 3.4.3)

Mutual Capacitance shall be measured in accordance with ASTM D4566.

5.2.5 Capacitance Unbalanced-Pair to Ground (see 3.4.4)

Capacitance Unbalanced shall be measured in accordance with ASTM D4566.

5.2.6 Direct Current Resistance (DCR) Unbalanced (see 3.4.5)

Conductor DCR Unbalanced of pairs shall be measured in accordance with ASTM D4566.

5.2.7 Near End Cross Talk (NEXT) (see 3.4.6)

NEXT shall be measured in accordance with ASTM D4566.

5.2.8 Near End Cross Talk (NEXT) on Mandrel (see 3.4.7)

At a distance of 15 feet (4.5 m) from the end of a 328 feet (100 m) cable to be measured, wrap the cable for a minimum of 5 turns (with a maximum of 8 turns) around a mandrel that is 12 times the diameter of the finished cable. Then, measure the Near End Cross Talk in accordance with ASTM D4566.

5.2.9 Power Sum Near End Cross Talk (PS-NEXT) (see 3.4.8)

PS-NEXT shall be calculated in accordance with the method prescribed in ASTM D4566.

5.2.10 Attenuation to Crosstalk Ratio-Far End (ACR-F) (see 3.4.9)

ACR-F shall be calculated in accordance with the method prescribed in ASTM D4566.

5.2.11 Power Sum Attenuation to Crosstalk Ratio-Far End (PSACR-F) (see 3.4.10)

PSACR-F shall be calculated in accordance with the method prescribed in ASTM D4566.

5.2.12 Return Loss: Return Loss (RL) (see 3.4.11)

Return Loss shall be measured in accordance with ASTM D4566.

5.2.13 Propagation Delay (see ASTM D4566, Phase Delay) (see 3.4.12)

Propagation Delay shall be measured in accordance with ASTM D4566, phase constant measurement or an equivalent method.

5.2.14 Propagation Delay Skew (see ASTM D4566, Phase Delay) (see 3.4.13)

Propagation Delay Skew shall be calculated from the propagation delay Measurements in accordance with ASTM D4566.

5.2.15 Velocity of Propagation (see ASTM D4566, Phase Velocity) (see 3.4.14)

Velocity of Propagation shall be measured In accordance with ASTM D4566.

5.2.15.1 Dielectric Withstand - Dry (see 3.4.15)

Component wires shall meet the minimum requirements when tested to each other and to the shield, if applicable, in accordance with MIL-STD-202 Method 301.

5.2.15.2 Dielectric Withstand - Wet (see 3.4.16)

The jacket shall meet the minimum requirements when tested in accordance with AS4373 Method 510. Prepare the sample such that the jacket is tested between the outer shield and water solution.

5.2.16 Spark Test (primary wires) (see 3.4.17)

Spark Test on primary wire shall be tested in accordance with AS4373 method 505.

5.2.17 Spark Test (finished cable) (see 3.4.18)

Spark Test on finished cable shall be tested in accordance with AS4373 method 505 (shield to ground).

5.3 Environmental Requirements (testing of finished cable)

5.3.1 Life Cycle (see 3.5.1)

Life Cycle shall be tested in accordance with AS4373 Method 807.

5.3.2 Fluid Immersion (see 3.5.2)

Fluid Immersion shall be tested in accordance with AS4373 Method 601.