



Designation: F2639 – 18

Standard Practice for Design, Alteration, and Certification of Aircraft Electrical Wiring Systems¹

This standard is issued under the fixed designation F2639; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 Definition—This practice defines acceptable practices and processes for the design, alteration, and certification of electric systems and installations in general aviation aircraft. This practice does not change or create any additional regulatory requirements nor does it authorize changes in or permit deviations from existing regulatory requirements.

1.2 Applicability—The guidance provided in this practice is directed to air carriers, air operators, design approval holders, Supplemental Type Certificate (STC) holders, maintenance providers, repair stations, and anyone performing field approval modifications or repairs.

1.3 Protections and Cautions—This practice provides guidance for developing actions and cautionary statements to be added to maintenance instructions for the protection of wire and wire configurations. Maintenance personnel will use these enhanced procedures to minimize contamination and accidental damage to electrical wiring interconnection system (EWIS) while working on aircraft.

1.4 “Protect and Clean As You Go” Philosophy—This philosophy is applied to aircraft wiring through inclusion in operators’ maintenance and training programs. This philosophy stresses the importance of protective measures when working on or around wire bundles and connectors. It stresses how important it is to protect EWIS during structural repairs, STC installations, or other alterations by making sure that metal shavings, debris, and contamination resulting from such work are removed.

1.5 This practice includes the following sections:

	Title	Section
Wire Selection		5
General		5.1
Aircraft Wire Materials		5.2
Table of Acceptable Wires		5.3
Severe Wind and Moisture Problems (SWAMP)		5.4

¹ This practice is under the jurisdiction of ASTM Committee F39 on Aircraft Systems and is the direct responsibility of Subcommittee F39.01 on Design, Alteration, and Certification of Electrical Systems.

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1.6 *Values*—The values given in inch-pound units are to be regarded as the standard. The values in parentheses are for information only. See **Appendix X2** for SI-based prefixes and powers of 10.

NOTE 1—Where SI units are required, refer to Annex 5 of ICAO.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.8 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 Unless approved by the administrator, the latest revision of the listed documents shall be used for reference.

2.2 ASTM Standards:²

F2490 Guide for Aircraft Electrical Load and Power Source Capacity Analysis

2.3 ANSI Standards:³

ANSI/EIA-5200000 Generic Specification for Special-Use Electromechanical Switches of Certified Quality

ANSI EIA/TIA-568-B Commercial Building Telecommunications Cabling Standard

ANSI J-STD-004 Requirements for Soldering Fluxes

2.4 FAA Standards:⁴

Advisory Circular 20-53() Protection of Aircraft Fuel Systems Against Fuel Vapor Ignition Due To Lightning

AC 20-136() Protection of Aircraft Electrical/Electronic Systems Against the Indirect Effects of Lightning

AC 21-16() RTCA Document DO-160D/E/F/G

AC 23.1309-1E Systems Safety Analysis and Assessment for Part 23 Airplanes

AC 25-16 Electrical Fault and Fire Prevention and Protection

AC 25.869-1() Electrical System Fire and Smoke Protection

AC 25.981-1() Fuel Tank Ignition Source Prevention Guidelines

AC 25.1353-1() Electrical Equipment and Installations

AC 25.1357-1() Circuit Protective Device Accessibility

AC 27-1B Certification of Normal Category Rotorcraft

AC 29-2C Certification of Transport Category Rotorcraft

DOT/FAA/CT 86/8 Determination of Electrical Properties of Bonding and Fastening Techniques

DOT/FAA/CT-83/3 Users Manual for FAA Advisory Circular 20-53a

DOT/FAA/CT-89-22 Aircraft Lightning Protection Handbook

Title14 Code of Federal Regulations Part 23 Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes

Title14 Code of Federal Regulations Part 25 Airworthiness Standards: Transport Category Airplanes

Title14 Code of Federal Regulations Part 27 Airworthiness Standards: Normal Category Rotorcraft

Title14 Code of Federal Regulations Part 29 Airworthiness Standards: Transport Category Rotorcraft

Title14 Code of Federal Regulations Part 31 Airworthiness Standards: Manned Free Balloons

Title14 Code of Federal Regulations Part 33 Airworthiness Standards: Aircraft Engines

Title14 Code of Federal Regulations Part 34 Fuel Venting and Exhaust Emission Requirements for Turbine Engine Powered Airplanes

Title14 Code of Federal Regulations Part 35 Airworthiness Standards: Propellers

Title14 Code of Federal Regulations Part 36 Noise Standards: Aircraft Type and Airworthiness Certification

2.5 SAE Standards:⁵

AMS-S-8802 Sealing Compound, Temperature-Resistant, Integral Fuel Tanks and Fuel Cell Cavities, High Adhesion (Replaces MIL-S-8802)

ARP 1199 Selection, Application, and Inspection of Electric Overcurrent Protective Devices

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁴ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, <http://www.access.gpo.gov>.

⁵ Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.