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Standard Test Method for Acoustic Emission Testing of Insulated and Non-Insulated Aerial Personnel Devices with Supplemental Load Handling Attachments¹

This standard is issued under the fixed designation F1430/F1430M; 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 This test method describes a procedure for acoustic emission (AE) testing of aerial personnel devices (APDs) with supplemental load handling attachments.

1.1.1 *Equipment Covered*—This test method covers the following types of vehicle-mounted aerial personnel devices with supplemental load handling attachments:

- 1.1.1.1 Extensible-boom APDs,
- 1.1.1.2 Articulating-boom APDs, and
- 1.1.1.3 Any combination of 1.1.1.1 and 1.1.1.2.

1.1.2 *Equipment Not Covered*—This test method does not cover any of the following equipment:

- 1.1.2.1 Aerial personnel devices without supplemental load handling attachments,
- 1.1.2.2 Digger-derricks with platform,
- 1.1.2.3 Cranes with platform, and
- 1.1.2.4 Aerial devices with load-lifting capabilities located anywhere other than adjacent to the platform.

NOTE 1—This test method is not intended to be a stand-alone NDT method for the verification of the structural integrity of an aerial device. Other NDT methods should be used to supplement the results.

1.2 The AE test method is used to detect and area-locate emission sources. Verification of emission sources may require the use of other nondestructive test (NDT) methods, such as radiography, ultrasonics, magnetic particle, liquid penetrant, and visual inspection. (**Warning**—This test method requires that external loads be applied to the superstructure of the vehicle under test. During the test, caution must be taken to safeguard personnel and equipment against unexpected failure or instability of the vehicle or components.)

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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

2. Referenced Documents

2.1 *ASTM Standards:*²

[E94 Guide for Radiographic Examination](#)

[E114 Practice for Ultrasonic Pulse-Echo Straight-Beam Contact Testing](#)

[E164 Practice for Contact Ultrasonic Testing of Weldments](#)

[E569 Practice for Acoustic Emission Monitoring of Structures During Controlled Stimulation](#)

[E650 Guide for Mounting Piezoelectric Acoustic Emission Sensors](#)

[E750 Practice for Characterizing Acoustic Emission Instrumentation](#)

¹ This test method is under the jurisdiction of ASTM Committee F18 on Electrical Protective Equipment for Workers and is the direct responsibility of Subcommittee F18.55 on Inspection and Non-Destructive Test Methods for Aerial Devices.

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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.

E976 Guide for Determining the Reproducibility of Acoustic Emission Sensor Response
 E1316 Terminology for Nondestructive Examinations
 E1417/E1417M Practice for Liquid Penetrant Testing
 E1444/E1444M Practice for Magnetic Particle Testing
 F914 Test Method for Acoustic Emission for Insulated and Non-Insulated Aerial Personnel Devices Without Supplemental Load Handling Attachments
 F2174 Practice for Verifying Acoustic Emission Sensor Response

2.2 Other Standards:

ANSI A92.2 Standard for Vehicle-Mounted Elevating and Rotating Aerial Devices³
 ASNT SNT-TC-1A Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing⁴

3. Terminology

3.1 Definitions:

3.1.1 *acoustic emission (AE)*—the class of phenomena whereby elastic waves are generated by the rapid release of energy from a localized source or sources within a material, or the transient elastic wave(s) so generated. Acoustic emission is the recommended term for general use. Other terms that have been used in AE literature include (1) stress wave emission, (2) microseismic activity, and (3) emission or acoustic emission with other qualifying modifiers.

3.1.2 *amplitude (acoustic emission signal amplitude)*—the peak voltage of the largest excursion attained by the signal waveform from an emission event.

3.1.3 *amplitude distribution*—a display of the number of acoustic emission events with signals that exceed an arbitrary amplitude as a function of amplitude.

3.1.4 *articulating-boom aerial device*—an aerial device with two or more hinged boom sections.

3.1.5 *attenuation*—the loss of energy per unit distance, typically measured as loss of signal peak amplitude with unit distance from the source of emission.

3.1.6 *channel*—an input to the main AE instrument that accepts a preamplifier output.

3.1.7 *commoned*—two or more sensors interconnected such that the sensor outputs are electronically processed by a single channel without differentiation of sensor origin.

3.1.8 *count* also *acoustic emission count, n*—the number of times the acoustic emission signal amplitude exceeds a preset threshold during any selected portion of a test.

3.1.9 *decibel (dB)*—the logarithmic expression of a ratio of two single peak amplitudes. A reference scale expresses the logarithmic ratio of a single peak amplitude to a fixed reference amplitude.

$$\text{Signal peak amplitude (dB)} = 20 \log_{10} (A_1/A_0)$$

where:

A_0 = 1 μ V at the sensor output (before amplification), and
 A_1 = peak voltage of the measured acoustic emission signal.

dB Value	Acoustic Emission Reference Scale	
	Voltage At Sensor Output	Voltage At Integral Preamp Sensor Output (40-dB Gain)
0	1 μ V	100 μ V
20	10 μ V	1 mV
40	100 μ V	10 mV
60	1 mV	100 mV
80	10 mV	1 V
100	100 mV	10 V

3.1.10 *insulated aerial personnel device (IAPD)*—any device (extensible or articulating) which is designed primarily to position personnel and may be equipped with a supplemental load handling attachment.

3.1.11 *event (acoustic emission event)*—a local material change giving rise to acoustic emission.

3.1.12 *event count (N_e)*—the number obtained by counting each discerned acoustic emission event once.

3.1.13 *extensible-boom aerial device*—an aerial device, except the aerial ladder type, with a telescopic or extensible boom.

3.1.14 *first-hit*—a mode of operation of AE monitoring equipment in which an event occurring on one channel will prevent all other channels from processing data for a specified period of time. The channel with a sensor closest to the physical location of the emission source will then be the only channel processing data from that source.

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 American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlington Ln., Columbus, OH 43228-0518, <http://www.asnt.org>.