Designation: F 1430 – 98

Standard Test Method for Acoustic Emission Testing of Insulated Aerial Personnel Devices with Supplemental Load Handling Attachments [1]

This standard is issued under the fixed designation F 1430; 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 insulated aerial personnel devices (IAPDs) with supplemental load handling attachments.

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

1.1.1.1 Extensible-boom IAPDs,

1.1.1.2 Articulating-boom IAPDs, 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 Noninsulated aerial devices,

1.1.2.2 Insulated aerial personnel devices without supplemental load handling attachments,

1.1.2.3 Digger-derricks with platform,

1.1.2.4 Cranes with platform, and

1.1.2.5 Aerial devices with load-lifting capabilities located anywhere other than adjacent to the platform.

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.

NOTE 1—**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 *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:*

E 569 Practice for Acoustic Emission Monitoring of Structures During Controlled Stimulation[2]

E 650 Guide for Mounting Piezoelectric Acoustic Emission Sensors[2]

E 750 Practice for Characterizing Acoustic Emission Instrumentation[2]

E 976 Guide for Determining the Reproducibility of Acoustic Emission Sensor Response[2]

E 1067 Practice for Acoustic Emission Testing of Fiberglass Reinforced Plastic Resin (FRP) Tanks/Vessels[2]

E 1316 Terminology for Nondestructive Examinations[2]

F 914 Test Method for Acoustic Emission for Insulated Aerial Personnel Devices[3]

2.2 *Other Standards:*

ANSI A92.2 Standard for Vehicle-Mounted Elevating and Rotating Aerial Devices[4]

ASNT SNT-TC-1A Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing[5]

Equipment Manufacturer's Institute,[6] Manufacturers of Aerial Devices and Digger-Derricks Council (EMI/MADDDC), Nomenclature and Specifications for Truck-Mounted:

(a) Extensible Aerial Devices,

(b) Articulating Aerial Devices, and

(c) Digger-Derricks

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

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[2] *Annual Book of ASTM Standards*, Vol 03.03.

[3] *Annual Book of ASTM Standards*, Vol 10.03.

[4] Available from the American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.

[5] Available from American Society of Nondestructive Testing, 4153 Arlingate Plaza, Caller #28518, Columbus, OH 43228.

[6] Available from the Equipment Manufacturer's Institute, 410 N. Michigan Ave., Chicago, IL 60611.

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 uV at the sensor output (before amplification), and

A_1 = peak voltage of the measured acoustic emission signal.

Acoustic Emission Reference Scale

dB Value	Voltage At Sensor Output	Voltage At Integral Preamp Sensor Output (40-dB Gain)
0	1 µV	100 µV
20	10 µV	1 mV
40	100 µV	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.

3.1.15 *insulated aerial device*—an aerial device designed with dielectric components to meet a specific electrical insulation rating.

3.1.16 *insulator*—any part of an aerial device such as, but not limited to, the upper boom, lower boom or supporting structure, made of a material having a high dielectric strength, usually FRP or the equivalent.

3.1.17 *noise*—any undesired signal that tends to interfere with the normal reception or processing of the desired signal.

3.1.18 *non-overcenter*—the feature of an aerial device is such that the upper boom cannot travel past vertical orientation with respect to the ground.

3.1.19 *overcenter*—the feature of an aerial device is such that the upper boom travels past vertical orientation with respect to the ground.

3.1.20 *qualified personnel*—personnel who, by possession of a recognized degree, certificate, professional standing, or skill, and who, by knowledge, training, and experience, have demonstrated the ability to deal with problems relating to the subject matter, the work, or the project.

3.1.21 *rated load capacity (RLC)*—the maximum allowable load as stated by the aerial device manufacturer which by combination of the platform load and supplemental load, may be placed on the aerial device at a designated boom position and a designated SLHA orientation.

3.1.22 *signal (emission signal)*—a signal obtained by detection of one or more acoustic emission events.

3.1.23 *supplemental load*—a load which may be affixed to a supplemental load-handling attachment on an insulated aerial personnel device.

3.1.24 *supplemental load attachment capacity (SLAC)*—the maximum allowable load, as stated by the aerial device manufacturer, which may be affixed to the supplemental load-handling attachment at specified positions of the attachments.

3.1.25 For definitions of other terms in this test method, refer to Terminology E 1316 and EMI/MADDDC.

3.2 *Definitions of Terms Specific to This Standard:* (see Fig. 1 and Fig. 2):

3.2.1 *elbow*—the structure connecting the upper boom to the lower boom, about which one boom articulates relative to the other.

3.2.2 *elbow pin*—the horizontal pin about which the upper boom rotates relative to the lower boom.

3.2.3 *lift cylinder*—the hydraulic cylinder that lifts the lower boom and the extensible boom(s).

3.2.4 *lower boom*—the structural member, attached to a turntable or base, that supports the upper boom.

3.2.5 *lower-boom cylinder*—the hydraulic cylinder that articulates the lower boom.

3.2.6 *lower-boom insulator*—the part of the lower boom made of high-dielectric strength material (usually fiberglass reinforced plastic or equivalent).

3.2.7 *lower-boom pin*—the horizontal pin about which the lower boom is raised and lowered relative to the turntable.

3.2.8 *outriggers*—the structural members that, when properly extended or deployed on firm ground, assist in stabilizing the vehicle on which the aerial device is mounted.

3.2.9 *pedestal*—the stationary base of the aerial device that supports the turntable.

3.2.10 *platform*—the personnel-carrying component of an aerial device, such as a bucket, basket, stand, or equivalent.

3.2.11 *platform pin*—the horizontal pin about which the platform rotates relative to the upper boom.