



Designation: F1797 – 18 (Reapproved 2022)

Standard Test Method for Acoustic Emission Testing of Insulated and Non-Insulated Digger Derricks¹

This standard is issued under the fixed designation F1797; 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 covers a procedure for acoustic emission (AE) testing of digger derricks.

1.1.1 *Equipment Covered*—This test method applies to special multipurpose vehicle-mounted machines, commonly known as digger derricks. These machines are primarily designed to dig holes, set poles, and position materials and apparatus.

1.1.1.1 Insulated and non-insulated type digger derricks may be evaluated with this test method.

1.1.1.2 Digger derricks, if so equipped to position personnel or equipment, or both, may also be evaluated with this test method in conjunction with Test Method F914.

1.1.2 *Equipment Not Covered*—Excluded from this test method are general-purpose cranes designed only for lifting service and machines primarily designed only for digging holes.

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, ultrasonic, magnetic particle, liquid penetrant, and visual inspection.

1.3 **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.

1.4 *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.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standard-*

ization 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 ASTM Standards:²

E94 Guide for Radiographic Examination Using Industrial Radiographic Film

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

E610 Terminology Relating to Acoustic Emission (Withdrawn 1991)³

E650 Guide for Mounting Piezoelectric Acoustic Emission Sensors

E750 Practice for Characterizing Acoustic Emission Instrumentation

E976 Guide for Determining the Reproducibility of Acoustic Emission Sensor Response

E1417/E1417M Practice for Liquid Penetrant Testing

E1444/E1444M Practice for Magnetic Particle Testing for Aerospace

F914 Test Method for Acoustic Emission for Aerial Personnel Devices Without Supplemental Load Handling Attachments

2.2 Other Standards:

ASNT Recommended Practice SNT-TC-1A—Personnel Qualification and Certification in Nondestructive Testing⁴

ANSI A10.31 Digger Derricks—Safety Requirements, Definitions, and Specifications⁵

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.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from American Society of Nondestructive Testing, 4153 Arlington Plaza, Caller #28518, Columbus, OH 43228.

⁵ Available from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

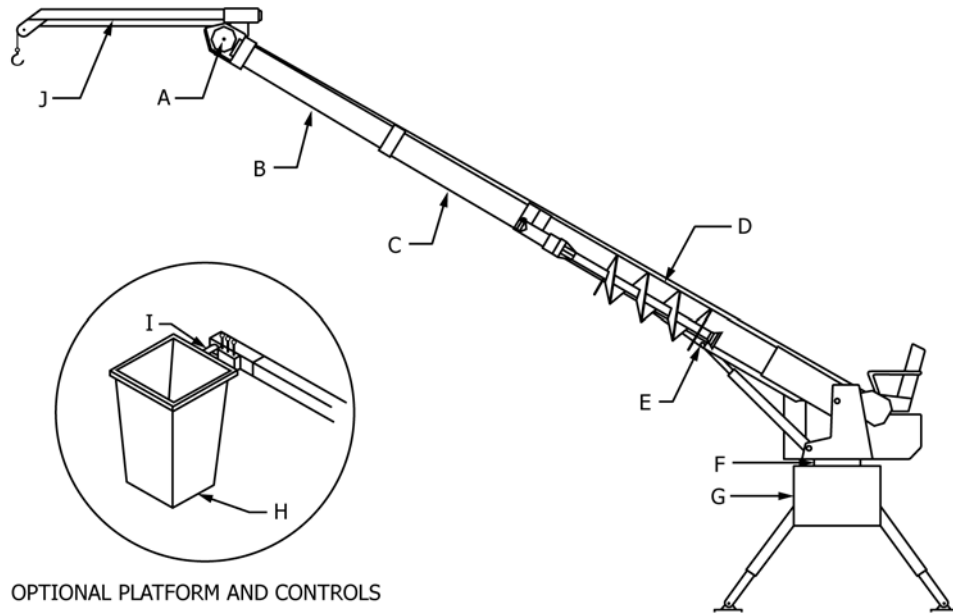


FIG. 1 Digger Derrick Nomenclature

EMI Nomenclature and Specifications for Truck-Mounted Extensible Aerial Devices, Articulating Aerial Devices, Digger-Derricks⁶

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.

3.1.1.1 *Discussion*—acoustic emission is the recommended term for general use. Other terms that have been used in AE literature include (1) stress wave emission, (2) micro-seismic 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 *attenuation*—loss of energy per unit distance, typically measured as loss of signal peak amplitude with unit distance from the source of emission.

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

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

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

3.1.8 *decibel, dB*—a reference scale that expresses the logarithmic ratio of a signal peak amplitude to a fixed reference amplitude.

$$\text{Signal peak amplitude (dB)} = 20 \log_{10} \frac{A_1}{A_0} \quad (1)$$

where:

A_0 = 1 μ V 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 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

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

3.1.10 *event count, N*—the number obtained by counting each discerned acoustic emission event once.

3.1.11 *first-hit*—a mode of operation of AE monitoring equipment in which an event occurring on one channel will

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