

**MIL-STD-1945**

**24 October 1984**

# **MILITARY HANDBOOK**

## **GLOSSARY OF TERMS AND DEFINITIONS FOR ACOUSTIC EMISSION TESTING PROCEDURES**



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MIL-STD-1945

DEPARTMENT OF DEFENSE  
WASHINGTON, DC 20301

Glossary of Terms and Definitions For Acoustic Emission Testing Procedures

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1. This military standard was developed by the Department of Defense with the assistance of the National Bureau of Standards, Washington DC in accordance with established procedure. It is approved for use by all Departments and Agencies of the Department of Defense.

2. It is the intent to review this handbook periodically to insure its completeness and currency. Users of this document are encouraged to report any errors discovered and any recommendations for changes or inclusions to Army Materials and Mechanics Research Center, ATTN: AMXMR-SMS, Arsenal Street, Watertown, MA 02172-2719

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FOREWARD

This standard prescribes terminology for use with acoustic emission test methods and procedures.

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1. SCOPE

1.1 Purpose. The terminology in this standard for acoustic emission test methods and procedures is intended for use on drawings, and in specifications, standards, and technical documents.

1.2 Source of definitions. The source of each definition taken from a publication is so identified at the end of the definition. If the definition is a composite taken from several sources it is identified as a composite. Definitions without identified source are original.

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2. REFERENCED DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this standard to the extent specified herein.

NONE

2.2 Other publications. The following documents form a part of this standard to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplements thereto, if applicable.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 750 - Standard Practice for Measuring the Operating Characteristics  
of Acoustic Emission Instrumentation

ASTM E 610 - Standard Definitions of Terms Relating to Acoustic Emission

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

SOCIETY OF THE PLASTICS INDUSTRY

CARP - Committee on Acoustic Emission from Reinforced Plastics. A working group of The Corrosion-Resistant Structures Committee of The Reinforced Plastics/Composites Institute of The Society of The Plastics Industry (SPI)

(The Society of the Plastics Industry, Inc. 355 Lexington Avenue, New York, New York 10017)

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## 3.0 ACOUSTIC EMISSION TERMS AND DEFINITIONS

ACOUSTIC EMISSION (AE). The class of phenomena whereby transient mechanical waves are generated by the rapid release of energy from localized sources in a material, or the transient mechanical waves so generated. (After ASTM E610-82).

ACOUSTIC EMISSION CHANNEL. The assembly of necessary mechanical receiving transducer (sensor), electronics, connecting cables and processor necessary to detect and process acoustic emission signals received at one location.

ACOUSTIC EMISSION COUNT (EMISSION COUNT). The number of times the amplitude of acoustic emission signals exceed a preset threshold voltage during any selected portion of a test. (After ASTM E610).

ACOUSTIC EMISSION COUNT RATE (EMISSION COUNT RATE). The time rate at which acoustic emission counts occur. (After ASTM E610-82).

ACOUSTIC EMISSION EVENT. A local material change giving rise to an acoustic emission. (After ASTM E610-82).

ACOUSTIC EMISSION EVENT ENERGY. The total mechanical energy radiated by an acoustic emission event. (After ASTM E610-82).

ACOUSTIC EMISSION RISE TIME. The time interval between the start of an AE signal and the instant the signal reaches its peak amplitude.

ACOUSTIC EMISSION SENSOR. See ACOUSTIC EMISSION TRANSDUCER.

ACOUSTIC EMISSION SIGNAL. A Voltage-time waveform obtained by detecting one or more acoustic emission events. (After ASTM E610-82).

ACOUSTIC EMISSION SIGNAL AMPLITUDE. The peak voltage of the waveform detected from an AE event.

ACOUSTIC EMISSION SIGNATURE. A characteristic set of reproducible attributes of AE signals associated with a specific test article as observed with a particular instrumentation system under specified test conditions.

ACOUSTIC EMISSION TRANSDUCER. An electro-acoustic (usually piezoelectric) device which converts the transient surface motion of a structure into an electrical signal. (Composite).

ACOUSTIC EMISSION WAVEGUIDE. A device that permits propagation of transient mechanical waves from a structure to a remotely mounted transducer during AE monitoring; examples of an AE waveguide include a solid wire or a rod which is acoustically coupled at one end to a structure under test and at the other end to a transducer. (After ASTM E610)

ARRIVAL TIME INTERVAL. The time interval between the detected arrival of an acoustic emission wave at any two transducers of a transducer array. (After ASTM E610-82).

BURST EMISSION. A qualitative description of an acoustic emission signal which appears to be caused by an individual acoustic emission event in a material. (Contrast with CONTINUOUS EMISSION). (After ASTM E610-82).

CONTINUOUS EMISSION. A qualitative description of sustained indistinguishable acoustic emission signals produced by rapidly occurring acoustic emission events. (After ASTM E610-82).

COUPLANT. A substance used at the structure - transducer interface to improve the transmission of acoustic energy across the interface (Composite).

COUNTING THRESHOLD. A preset voltage threshold which results in the decision to process a signal only if the signal amplitude exceeds the level.

DEAD BAND. The range of voltages between the counting threshold and the background noise level where AE signals may be detected but will not be processed.

DEAD TIME, INSTRUMENTATION. The time interval following an acoustic emission signal which exceeds the counting threshold during which the instrumentation is incapable of meeting specified performance. It involves the overload recovery time and the rearm delay time. (After ASTM E750).

EVENT COUNT. The number obtained by counting, over a specified time, each discerned acoustic emission event once. (After ASTM 610-82).

EVENT COUNT RATE. The time rate of the acoustic emission event count. (ASTM E610-82).

FELICITY EFFECT. The presence of significant acoustic emission from a material at loads below those previously applied; also referred to as the breakdown of the KAISER EFFECT (See). (After CARP).

FELICITY RATIO. A measure of the Felicity Effect defined by the load at which acoustic emission occurs divided by the previously attained maximum load which for some materials, may be indicative of the amount of damage. (After CARP).

FLOATING THRESHOLD. A counting threshold that is automatically varied to maintain its value relative to the background noise level.

HSU PENCIL SOURCE. A mechanical input source of simulated acoustic emission injected into a structure by pressing in a controlled manner, the protruding lead of a suitable pencil against the structure until the lead fractures thus introducing a point-force-time history event which is nearly a step-function.



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KAISER EFFECT. A phenomenon exhibited by some materials whereby, at a fixed sensitivity level, detectable acoustic emission is absent until previously applied load levels are exceeded. (After ASTM E610-82).

OVERLOAD RECOVERY TIME. The time required for an instrument or component to return to specified performance after an acoustic emission signal which exceeds the linear operating range is detected.

REARM DELAY TIME. The time interval during which the instrumentation rejects further signals for processing following the acceptance of an acoustic emission signal. The time may be fixed or adjustable.

RING-DOWN COUNT. See ACOUSTIC EMISSION COUNT.

SENSOR. See ACOUSTIC EMISSION TRANSDUCER.

SOURCE. The local process in a material which produces the transient mechanical waves associated with acoustic emission.

SOURCE ACTIVITY A characteristic of an acoustic emission source used to classify it as to its persistence, usually based on the rate of acoustic emission count or event count for a constant load. (Composite).

SOURCE INTENSITY. A characteristic of the acoustic emission from a source used to classify its severity, usually based on some parameter related to the magnitude or duration or energy of the detected transient wave. (Composite).

STIMULATION. The application of a stimulus such as force, pressure, heat, etc. to a test article to cause activation of acoustic emission sources. (ASTM E610-82).

SYSTEM SENSITIVITY. The response of an acoustic emission system including the mounted sensor and its cable, to a specified simulated AE input, e.g., a Hsu Pencil Source.

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## Preparing activity:

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Army -- AR, AV, AT  
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## User activities:

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Air Force -- 80

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