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Standard Guide for Acoustic Emission Examination of Concrete Structures¹

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1. Scope

1.1 This guide describes the application of acoustic emission (AE) technology for examination of concrete and reinforced concrete structures during or after construction, or in service.

1.2 Structures under consideration include but are not limited to buildings, bridges, hydraulic structures, tunnels, decks, pre/post-tensioned (PT) structures, piers, nuclear containment units, storage tanks, and associated structural elements.

1.3 AE examinations may be conducted periodically (short-term) or monitored continuously (long-term), under normal service conditions or under specially designed loading procedures. Examples of typical examinations are the detection of growing cracks in structures or their elements under normal service conditions or during controlled load testing, long term monitoring of pre-stressed cables, and establishing safe operational loads.

1.4 AE examination results are achieved through detection, location, and characterization of active AE sources within concrete and reinforced concrete. Such sources include micro- and macro-crack development in concrete due to loading scenarios such as fatigue, overload, settlement, impact, seismicity, fire and explosion, and also environmental effects such as temperature gradients and internal or external chemical attack (such as sulfate attack and alkali-silica reaction) or radiation. Other AE source mechanisms include corrosion of rebar or other metal parts, corrosion and rupture of cables in pre-stressed concrete, as well as friction due to structural movement or instability, or both.

1.5 This guide discusses selection of the AE apparatus, setup, system performance verification, detection and processing of concrete damage related AE activity. The guide also provides approaches that may be used in analysis and interpretation

of acoustic emission data, assessment of examination results and establishing accept/reject criteria.

1.6 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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 and health 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 ASTM Standards:²

E543 Specification for Agencies Performing Nondestructive Testing

E1316 Terminology for Nondestructive Examinations

E1932 Guide for Acoustic Emission Examination of Small Parts

E2374 Guide for Acoustic Emission System Performance Verification

2.2 ANSI/ASNT Standards:³

SNT-TC-1A Recommended Practice for Nondestructive Testing Personnel Qualification and Certification

ANSI/ASNT CP-189 Standard for Qualification and Certification of Nondestructive Testing Personnel

¹ This test method is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.04 on Acoustic Emission Method.

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