



Standard Practice for Guided Wave Testing of Above Ground Steel Piping with Magnetostrictive Transduction¹

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1. Scope

1.1 This practice provides a guide for the use of waves generated using magnetostrictive transduction technology for guided wave testing (GWT) welded tubulars. Magnetostrictive materials transduce or convert time varying magnetic fields into mechanical energy. As a magnetostrictive material is magnetized, it strains. Conversely, if an external force produces a strain in a magnetostrictive material, the material's magnetic state will change. This bi-directional coupling between the magnetic and mechanical states of a magnetostrictive material provides a transduction capability that can be used for both actuation and sensing devices.

1.2 GWT utilizes ultrasonic guided waves in the 10 to approximately 250 kHz range, sent in the axial direction of the pipe, to non-destructively test pipes for discontinuities or other features by detecting changes in the cross-section or stiffness of the pipe, or both.

1.3 GWT is a screening tool. The method does not provide a direct measurement of wall thickness or the exact dimensions of discontinuities. However, an estimate of the severity of the discontinuity can be obtained.

1.4 This practice is intended for use with tubular carbon steel products having nominal pipe size (NPS) 2 to 48 corresponding to 60.3 to 1219.2 mm (2.375 to 48 in.) outer diameter, and wall thickness between 3.81 and 25.4 mm (0.15 and 1 in.).

1.5 This practice only applies to GWT of basic pipe configuration. This includes pipes that are straight, constructed of a single pipe size and schedules, fully accessible at the test location, jointed by girth welds, supported by simple contact supports and free of internal, or external coatings, or both; the pipe may be insulated or painted.

1.6 This practice provides a general practice for performing the examination. The interpretation of the guided wave data

obtained is complex and training is required to properly perform data interpretation.

1.7 This practice does not establish an acceptance criterion. Specific acceptance criteria shall be specified in the contractual agreement by the cognizant engineer.

1.8 *Units*—The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.9 *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.*

2. Referenced Documents

2.1 ASTM Standards:²

E543 Specification for Agencies Performing Nondestructive Testing

E1065 Practice for Evaluating Characteristics of Ultrasonic Search Units

E1316 Terminology for Nondestructive Examinations

E1324 Guide for Measuring Some Electronic Characteristics of Ultrasonic Testing Instruments

E2775 Practice for Guided Wave Testing of Above Ground Steel Pipework Using Piezoelectric Effect Transduction

IEEE/SI-10 American National Standard for Metric Practice

2.2 Other Standards:³

SNT-TC-1A Personnel Qualification and Certification in Non-Destructive Testing

3. Terminology

3.1 Definitions of terms specific to this standard are provided in this section. Some common terms such as *defect* may be referenced to Terminology **E1316**.

3.2 Definitions of Terms Specific to This Standard:

¹ This practice is under the jurisdiction of ASTM Committee **E07** on Nondestructive Testing and is the direct responsibility of Subcommittee **E07.10** on Specialized NDT Methods.

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