



# Standard Practice for Guided Wave Testing of Above Ground Steel Pipework Using Piezoelectric Effect Transduction<sup>1</sup>

This standard is issued under the fixed designation E2775; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This practice provides a procedure for the use of guided wave testing (GWT), also previously known as long range ultrasonic testing (LRUT) or guided wave ultrasonic testing (GWUT).

1.2 GWT utilizes ultrasonic guided waves, sent in the axial direction of the pipe, to non-destructively test pipes for defects or other features by detecting changes in the cross-section and/or stiffness of the pipe.

1.3 GWT is a screening tool. The method does not provide a direct measurement of wall thickness or the exact dimensions of defects/defected area; an estimate of the defect severity however can be provided.

1.4 This practice is intended for use with tubular carbon steel or low-alloy 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 covers GWT using piezoelectric transduction technology.

1.6 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.

1.7 This practice provides a general procedure for performing the examination and identifying various aspects of particular importance to ensure valid results, but actual interpretation of the data is excluded.

1.8 This practice does not establish an acceptance criterion. Specific acceptance criteria shall be specified in the contractual agreement by the responsible system user or engineering entity.

1.9 *Units*—The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.10 *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:<sup>2</sup>

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

2.2 Equipment Manufacturer's User's Manual

## 3. Terminology

### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *circumferential extent*—the length of a pipe feature in the circumferential direction, usually given as a percentage of the pipe circumference.

3.1.2 *coherent noise*—indications caused by real discontinuities causing a background noise, which exponentially decays with distance.

3.1.3 *Cross-Sectional Area Change (CSC)*—the CSC is calculated assuming that a reflection is purely caused by a change in cross-section. It is given as a percentage of the total cross-section. However it is commonly used to report the relative amplitude of any signal regardless of its source.

3.1.4 *Distance Amplitude Correction (DAC) curve*—a reference curve plotted using reference reflections (for example, weld reflections) at different distances from the test position.

<sup>1</sup> 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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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.