Recommended Practice for Ultrasonic Evaluation of Pipe Imperfections

API RECOMMENDED PRACTICE 5UE
SECOND EDITION, JUNE 2005

ADDENDUM 1, APRIL 2009

REAFFIRMED, JULY 2020

American
Petroleum
Institute

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Upstream Segment

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Recommended Practice for Ultrasonic Evaluation of Pipe Imperfections

1 Scope

1.1 This recommended practice describes procedures which may be used to "prove-up" the depth or size of imperfections. Included in this practice are the recommended procedures for ultrasonic prove-up inspection of new pipe using the Amplitude Comparison Technique and the Amplitude-Distance Differential Technique for evaluation of 1) surface breaking imperfections in the body of pipe and 2) surface breaking and subsurface imperfections in the weld area of electric resistance, electric induction or laser welded pipe and 3) surface breaking and subsurface imperfections in the weld area of arc welded pipe. For the purpose of this document, pipe is defined as including casing, plain-end casing liners, tubing, plain-end drill pipe, line pipe, coiled line pipe, pup joints, coupling stock, and connector material.

1.2 Prove-up inspection is a method to evaluate the radial depth of imperfections detected by automated inspection equipment or other nondestructive testing (NDT) technique(s) to determine acceptance criteria compliance with the appropriate API specification.

1.3 The recommended prove-up practices established within this document are intended as a guide, and nothing in this guide should be interpreted to prohibit the agency or owner from supplementing the guide with other techniques or extending existing techniques.

1.4 This RP covers evaluation, a description of inspection methods, calibration and standardization procedures, and inspection personnel requirements for prove-up.

1.5 Appendix A of this document is provided as an overview to inform the user of the basis for the techniques outlined in this RP.

1.6 Appendix B of this document provides a procedure for determining if imperfections are surface breaking and a formula for calculating the sound path distance for a circumferential or axial scan of a curved surface and a sample look-up table.

1.7 Appendix C of this document is provided as an overview to inform the user of the specifics for the evaluation of welds with filler metal.

1.8 Appendix D of this document provides a procedure for sizing planar non-surface breaking imperfections from the pipe's outside surface.

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2 References

2.1 This recommended practice includes by reference, either in total or in part, the latest editions of the following API and industry standards, unless a specific edition is listed.

API

RP 5A5	*Field Inspection of New Casing, Tubing, and Plain-end Drill Pipe*
Spec 5CT	*Casing and Tubing*
Spec 5D	*Drill Pipe*
Spec 5L	*Line Pipe*
RP 5L8	*Field Inspection of New Line Pipe*
Std 5T1	*Imperfection Terminology*

ASNT[1]

SNT-TC-1A	*Personnel Qualification and Certification in Nondestructive Testing*

ASTM[2]

E 317	*Standard Practice for Evaluating Performance Characteristics of Ultrasonic Pulse-echo Testing Systems Without the Use of Electronic Measurement Instruments*
E 1065	*Standard Guide for Evaluating Characteristics of Ultrasonic Search Units*

3 Definitions

The following terms are used frequently in the nondestructive testing of pipe:

3.1 A-scan: A method of data presentation utilizing a horizontal time-base that indicates distance or time and a vertical deflection from the base line that indicates amplitude.

3.2 active peak memory: The capability of an instrument to retain an A-scan presentation while allowing instrument controls to be functionally active.

3.3 agency: An entity contracted to inspect new pipe using the methods and criteria specified.

3.4 Amplitude Comparison Technique (ACT): An ultrasonic prove-up method comparing the reflected signals from a reference indicator of known radial depth and an imperfection.

3.5 Amplitude Distance Differential Technique (ADDT): An ultrasonic prove-up method comparing both the

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[2]American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959.