Qualification of Metal Additive Manufacturing Processes and Components Production Control for Use in the Petroleum and Natural Gas Industries

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Qualification of Metal Additive Manufacturing Processes and Components Production Control for Use in the Petroleum and Natural Gas Industries

1 Scope

1.1 Purpose

This standard specifies requirements for qualification of the manufacturing process, components production control, marking, and documentation of additively manufactured metallic components used in the petroleum and natural gas industries when referenced by an applicable API equipment standard or otherwise specified as a requirement for conformance. The qualification process flowchart is shown in Figure 1.

1.2 Applicability

This standard applies to additively manufactured metallic components produced by powder bed fusion (PBF), directed energy deposition (DED), and binder jetting (BJT) processes.

1.3 Additive Manufacturing Specification Levels

This standard establishes requirements for three additive manufacturing (AM) specification levels (AMSL). These three AMSL designations—AMSL 1, AMSL 2, and AMSL 3—define increasing levels of AM technical, quality, and qualification requirements.

NOTE An AMSL can be assigned to a component by a product specification or standard, the purchaser, or the manufacturer.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API Specification Q1, *Quality Management System Requirements for Organizations Providing Products for the Petroleum and Natural Gas Industry*

API Specification 6A, *Specification for Wellhead and Tree Equipment*

ANSI [1]/ASQ Z1.4 [2], *Sampling Procedures and Tables for Inspection by Attributes*

ASME *Boiler and Pressure Vessel Code* [3], *Section II—Materials, Part C—Specifications for Welding Rods, Electrodes, and Filler Metals*

ASME *Boiler and Pressure Vessel Code*, *Section IX—Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators*

ASNT SNT-TC-1A [4], *Personnel Qualification and Certification in Nondestructive Testing*

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[1] American National Standards Institute, 1899 L Street, NW, Washington, DC 20036, www.ansi.org.

[2] American Society for Quality, 600 North Plankinton Avenue, Milwaukee, Wisconsin 53203, www.asq.org.

[3] American Society of Mechanical Engineers, Two Park Avenue, New York, New York 10016, www.asme.org.

[4] American Society for Nondestructive Testing, 1201 Dublin Road, Suite G04, Columbus, Ohio 43215, www.asnt.org.