

Process Specification for Eddy Current Inspection

Engineering Directorate

Structural Engineering Division

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REVISIONS		
VERSION	CHANGES	DATE
--	Original version	12/1/00
A	Reviewed document per QMS requirements. Updated division name, organization codes, and document numbers.	04/22/04

B	Added new NDE calibration notch classes and NDE standards. Added applicability to inspection of bolts. Defined standard NDE and special NDE in terms of calibration notch size and crack detectability	05/01/08
C	Added “array probes or wide area coverage probes” in para 2.1. Added source-detector probes in para. 5.5.1.2. Added explanation on crack detectability size in para. 5.5.4.5.	9/30/10
D	Added SNT-TC-1A to paragraph 4.0. Revised paragraph 8.0 for uniformity across all NDE PRCs.	6/29/11

1.0 **SCOPE**

This process specification establishes the minimum requirements for eddy current inspection of flat surfaces, fastener holes, threaded fasteners and seamless and welded tubular products made from nonmagnetic alloys such as aluminum and stainless steel.

2.0 **APPLICABILITY**

This specification is primarily applicable to in-process, final, and in-service eddy current inspections to detect surface and near surface cracks and crack-like flaws. However, usage is not limited to those applications.

2.1 **FLAT SURFACES**

This specification is applicable to the inspection of relatively flat surfaces with a surface finish of 125 μ in. or better. This process shall be used for directed inspections of critical or damaged areas. It shall not be used for global inspection of areas greater than 2 sq. ft. unless automated scanning equipment, array probes or wide area coverage probes are used.

2.2 **FASTENER HOLES**

This specification is applicable to the inspection of open fastener holes with an interior surface finish of 125 μ in. or better using a rotating hole scanner or a manual bolt hole probe.

2.3 **THREADED FASTENERS**

This specification is applicable to the inspection of root of fastener threads, shank surface, shank neck down region and fillet radius under the bolt head with surface finish of 125 μ in. or better and fillet radius of 1/32 in. or greater.

2.4 **TUBULAR PRODUCTS**

This specification is applicable to the inspection of both seamless and welded tubular products using either an encircling or probe coil technique. The use of ID probe techniques is not covered by this specification. This specification covers the inspection of tubular products ranging in diameter from 0.125 to 5 in. with wall thicknesses ranging from 0.005 to 0.250 in.

3.0 USAGE

This specification shall be invoked by an inspection callout on the engineering drawing or by a reference in a Process Specification, Task Performance Sheet, Discrepancy Report/Material Review Record, or other appropriate document. The engineering drawing or referencing document shall identify the specific part features or areas that require inspection. Typical eddy current inspection callouts are as follows:

EDDY CURRENT INSPECT ALL HOLES PER NASA/JSC PRC-6509 TO STANDARD LEVEL NDE.

When fracture control requirements necessitate Special Nondestructive Evaluation (NDE) of a fracture critical component, the requirement for Special NDE shall appear in the inspection note as shown below. When Special NDE is required, the specific inspection procedure and inspector shall be qualified in accordance with Section 6.0.

EDDY CURRENT INSPECT AREA SHOWN PER NASA/JSC PRC-6509 TO SPECIAL LEVEL NDE. SPECIAL NDE CERTIFICATION REQUIRED.

3.1 INSPECTION SEQUENCE

The stage in the manufacturing process where inspection is performed should be specified on the engineering drawing or in the referencing document.

3.2 ACCEPTANCE CRITERIA

Any indication greater than 50 percent of the reference notch response shall be cause for rejection. For fracture critical parts, questionable or relevant indications or indications that meet the noise ratio requirements per 5.5.4.4 and have less than 50 percent of the reference notch response shall be reported to the responsible engineering organization for disposition.

4.0 REFERENCES

The following specifications, standards, and handbooks form a part of this document to the extent specified herein. All documents listed are assumed to be the current revision unless a specific revision is listed. In case of conflict between this specification and the technical requirements cited in other referenced documents, the requirements of this document take precedence.

ASTM E 426

Standard Practice for Electromagnetic (Eddy Current) Examination of Seamless and Welded Tubular

Products, Austenitic Stainless Steel and Similar Alloys

NASA-STD-5009	<i>Nondestructive evaluation requirements for Fracture Critical Metallic Components</i>
NAS 410	<i>NAS Certification & Qualification of Nondestructive Test Personnel</i>
NASA –STD-5019	<i>Fracture Control Requirements for Spaceflight Hardware</i>
PRC-5010	<i>Process Specification for Pickling, Etching, and Descaling of Metals</i>
SAE ARP4402	<i>Eddy Current Inspection of Open Fastener Holes in Aluminum Aircraft Structure</i>
SAE AS4787	<i>Eddy Current Inspection of Circular Holes in Nonferrous Metallic Aircraft Engine Hardware</i>
SNT-TC-1A	<i>Personnel Qualification and Certification in Nondestructive Testing</i>

The following references were used to develop this process specification:

JSC 8500C	<i>Engineering Drawing System Requirements</i>
SOP-007.1	<i>Preparation and Revision of Process Specifications</i>
SAE ARP K99-AA	<i>Eddy Current Surface Crack Detection in Aerospace Structures (Draft document prepared by SAE AMS Committee K, Nondestructive Methods and Processes)</i>

5.0 PROCESS REQUIREMENTS

5.1 GENERAL

Eddy Current inspection of flat surfaces, including surfaces around fastener holes, shall be performed in accordance with this specification. Fastener holes in aluminum parts shall be inspected in accordance with SAE ARP4402 and in other alloys in accordance with SAE AS4787 except as modified by this