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① INACTIVE FOR DESIGN AFTER 7 November 1980.
FOR DESCRIPTION OF STATUS NOTES, SEE NAS 380.

CUSTODIAN: NATIONAL AEROSPACE STANDARDS COMMITTEE		
PROCUREMENT SPECIFICATION	TITLE HEAT TREATMENT AND PROCESSING REQUIREMENTS FOR 5% CR ULTRA HIGH STRENGTH ALLOY STEEL (H-11) FASTENERS	CLASSIFICATION SPECIFICATION
		NAS 1511 SHEET 1 OF 8

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APPROVAL DATE Sept. 1961 REVISION ① November 1980

NATIONAL AEROSPACE STANDARD

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC., 610 SHOREHAM BUILDING, WASHINGTON 25, D. C.

1. SCOPE

- 1.1 The purpose of this specification is to establish heat treatment and processing details for fasteners made from 5% CR ultra high strength alloy steel (H-11).

2. APPLICABLE SPECIFICATIONS

2.1 Specifications

Federal - Federal Standard No. 151 Federal Test Method - Metals, Test Method.

Military - MIL-I-6868 Inspection Process - Magnetic Particle

MIL-S-7742 Screw Threads - Standard Aeronautical

MIL-S-8879 Screw Threads, Controlled Radius Root with Increased Minor Dia; General Specification for

MIL-H-6875 Process for Heat-Treatment of Steels

- 2.2 Conflicts - In the event of a conflict between the drawing and this specification, the drawing will take precedence.

3. EQUIPMENT - Except as noted herein, all heat treating equipment shall conform with the requirements of MIL-H-6875.

- 3.1 Protective Heating Media - Heating may be done in air furnaces or furnaces having the following protective heating media: neutral atmosphere, neutral salt, or inert gas (argon).

- 3.2 Furnace temperature Uniformity - Temperature in working zone of tempering furnaces shall be maintained within ± 10 F of Table I. Temperature in the working zone of all other furnaces shall be ± 25 F of Table I. Air furnaces shall be limited to stress relieving and tempering, or to other heat treating operations on those parts which will have at least 0.025 in. material removed from all surfaces after heat treating.

4. PROCESSING DETAILS

- 4.1 General Fabrication and Blank Forming

- 4.1.1 Forging or hot heading temperature - shall be performed in the temperature range of 1750 F to 2100 F.

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PROCUREMENT
SPECIFICATION

TITLE
HEAT TREATMENT AND PROCESSING
REQUIREMENTS FOR 5% CR ULTRA HIGH
STRENGTH ALLOY STEEL (H-11) FASTENERS

CLASSIFICATION
SPECIFICATION

NAS 1511
SHEET 2

APPROVAL DATE Sept. 1961 REVISION

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- 4.1.2 Sharp edges, fillets and notches - resulting from fabrication operations shall be removed prior to any heating operation involving temperatures of 1500 F and above, except annealing.
- 4.1.3 Cold straightening - straightening by permanent deformation must be done at temperatures below 1100 F. Fasteners cold straightened in the fully hardened and tempered condition shall be stress relieved per Table I after straightening.
- 4.1.4 Abrasive cutting - may be used prior to final heat treatment only.
- 4.1.5 Stress relief - recommended after heavy forming, rough machining and grinding that introduce high internal stresses.
- 4.2 Thread Forming
 - 4.2.1 External threads - unless otherwise specified, all threads made per MIL-S-7742 shall be formed by thread rolling. Threads up to 7/8 inch in diameter shall be formed after final hardening (partial thread rolling techniques may be used providing at least 10% of the rolling is done after heat treating). Threads 7/8 inch and over may be rolled before or after final hardening. Other external thread types such as "root radius" per MIL-S-8879 may in all sizes be rolled or ground either before or after final hardening.
 - 4.2.2 Internal threads - all internal threads may be ground or cut prior to final heat treatment. It is recommended that, when thread forming is to be done before final heat treatment, parts be heat treated to the intermediate strength range prior to thread forming. Threads are to be smooth, well formed, and free from burrs, tears, etc.
- 4.3 Grinding
 - 4.3.1 Except as noted in paragraph 4.3.2 grinding on fully heat treated parts shall be followed by stress relief (as soon as possible after grinding and in any case prior to operations such as thread rolling, fillet rolling, shot peening, plating and/or final magnetic inspection). Detection of grinding burns by acid or alkaline etching shall be done by qualified personnel only.

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