

FED. SUPPLY CLASS

5320

## 1.0 SCOPE

**1.1 Purpose.** This specification defines the requirements of the Crimplock fastening system consisting of crimp nuts and flush or protruding head crimp pins. The installed Crimplock fastening system provides for an assembly with uniform clamping force and a mechanically locked nut to a pin. The installed components result in a permanently installed fatigue-rated fastener for aerospace structures.

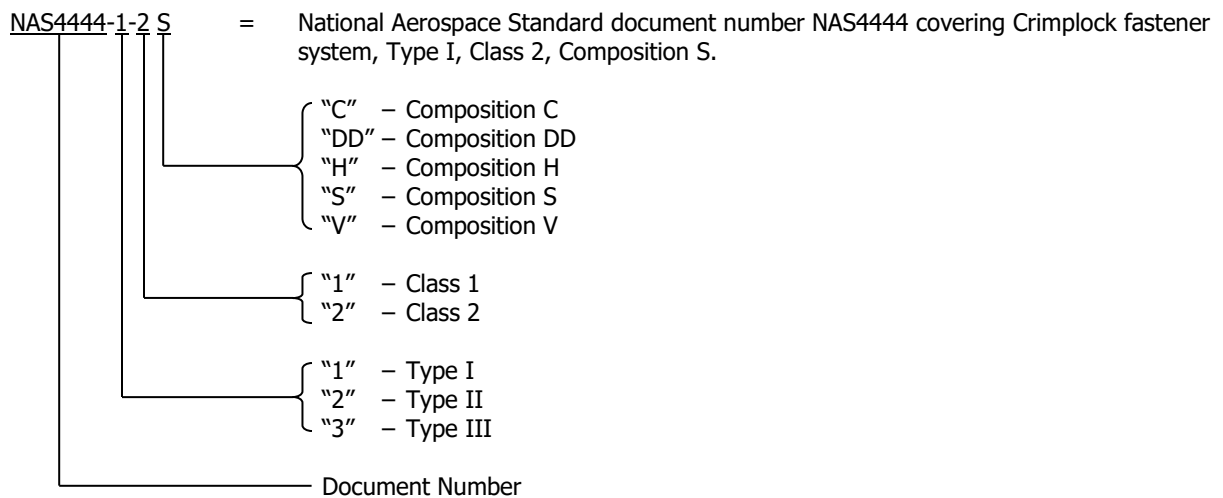
**1.2 Classification.** The crimp pins and nuts covered by this specification shall be of the types, sizes, configuration and materials designated by the part numbers specified on the applicable NAS standard which refer to this specification and further described as follows.

- Type I – Protruding Head Crimp Pins 100°
- Type II – Flush Head Crimp Pins
- Type III – Crimp Nuts

- Class 1 – Shear Head
- Class 2 – Tension Head

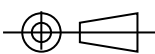
- Composition C – CRES, A286 (UNS S66286) per AMS5737
- Composition DD – Aluminum Alloy, 2024-T62 (UNS A92024) per QQ-A-430
- Composition H – Tool Steel, H-11 (UNS T20811) per AMS6485 AMS6487
- Composition V – Titanium Alloy, 6Al-4V (UNS R56400)
- Composition S – Alloy Steel: 4340 (UNS G43400) per MIL-S-5000 AMS6415 or AMS6484;  
4027 (UNS G40270) per QQ-S-624 ASTM A304, ASTM A322, or ASTM A108;  
4037 (UNS G40370) per MIL-S-8695 AMS6300;  
8740 (UNS G87400) per MIL-S-6049 AMS6322, AMS6325, or AMS6327;  
4130 (UNS G41300) per MIL-S-6758 AMS-S-6758

**1.2.1 Classification requirements identifier.** The requirements defined in this specification shall be identified by the requirement identifying numbers as shown below:



## 2.0 APPLICABLE DOCUMENTS

**2.1** Documents listed herein of the issue in effect on the date of price inquiry are a part of this specification to the extent indicated. In the event of conflict between the requirements of this specification and referenced documents, the requirements herein shall govern.

|                                                                                                                   |                                                                |                                                                                |
|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------|
| <p>THIRD ANGLE PROJECTION</p>  | <p>CUSTODIAN</p> <p>NATIONAL AEROSPACE STANDARDS COMMITTEE</p> | <p>REVISION</p> <p><b>6</b></p>                                                |
| <p>PROCUREMENT SPECIFICATION</p> <p>NONE</p>                                                                      | <p>TITLE</p> <p><b>CRIMPLOCK FASTENER SYSTEM</b></p>           | <p>CLASSIFICATION SPECIFICATION</p> <p><b>NAS4444</b></p> <p>SHEET 1 OF 24</p> |

USE OF OR RELIANCE UPON THIS DOCUMENT OR ANY NATIONAL AEROSPACE STANDARD IS ENTIRELY VOLUNTARY. AIA DOES NOT QUALIFY SUPPLIERS OR CERTIFY CONFORMANCE OF ITEMS PRODUCED UNDER NATIONAL AEROSPACE STANDARDS. AIA MAKES NO REPRESENTATION OR CLAIM RESPECTING (1) THE SUITABILITY OF ITEMS FOR ANY PARTICULAR APPLICATION OR (2) THE EXISTENCE OF OR APPLICABILITY THERETO OF PATENT OR TRADEMARKS RIGHTS.

2.1.1 Governmental

Federal:

- 6 QQ-A-430 Aluminum Alloy Rod and Wire, For Rivets and Cold Heading  
 6 QQ-S-624 Steel, Bar, Alloy, Hot Rolled and Cold Finished (General Purpose)  
 6 GGG-W-636 Wrenches, (Box, Open End, and Combination)  
 6 GGG-W-641 Wrench, Socket; (And Sockets, Handles, and Attachments For Socket Wrenches; Hand)

Military:

- MIL-STD-129 Marking For Shipment and Storage  
 MIL-S-5000 Steel, Chrome Nickel Molybdenum (E4340) Bars and Reforging Stock  
 MIL-S-6049 Steel, Chrome Nickel Molybdenum (8740) Bars and Forging Stock (Aircraft Quality)  
 MIL-S-6758 Steel, Chrome Molybdenum (4130) Bars and Reforging Stock (Aircraft Quality)  
 MIL-A-8625 Anodic Coatings, For Aluminum and Aluminum Alloys  
 MIL-S-8695 Steel, Bars and Wire, Molybdenum (4037) (Aircraft Quality)

- 6 Copies can be obtained from DLA Document Services. <https://quicksearch.dla.mil/>

2.1.2 Nongovernmental

American National Standards Institute (ANSI)

- ANSI/ASQ Z1.4 Sampling Procedures and Tables For Inspection By Attributes

Copies can be obtained from the American Society for Quality, 600 North Plankinton Ave., Milwaukee, WI 53203.  
[www.asq.org](http://www.asq.org)

ASTM International

- ASTM A108 Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished  
 ASTM A304 Standard Specification for Carbon and Alloy Steel Bars Subject to End-Quench Hardenability Requirements  
 6 ASTM A322 Standard Specification for Steel Bars, Alloy, Standard Grades  
 6 ASTM E1417/E1417M Standard Practice for Liquid Penetrant Testing  
 ASTM E1444/E1444M Standard Practice for Magnetic Particle Testing  
 ASTM D1974/D1974M Standard Practice for Methods of Closing, Sealing, and Reinforcing Fiberboard Boxes  
 ASTM D5118/D5118M Standard Practice for Fabrication of Fiberboard Shipping Boxes

Copies can be obtained from ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. [www.astm.org](http://www.astm.org)

Aerospace Industries Association

- 6 NASM1312-6 Fastener Test Methods, Method 6, Hardness  
 NASM1312-7 Fastener Test Methods, Method 7, Vibration  
 NASM1312-8 Fastener Test Methods, Method 8, Tensile Strength  
 NASM1312-11 Fastener Test Methods, Method 11, Tension Fatigue  
 NASM1312-13 Fastener Test Methods, Method 13, Double Shear Test  
 6 NASM1312-16 Fastener Test Methods, Method 16, Clamping Force for Installation, Formed Fasteners  
 6 NASM1312-20 Fastener Test Methods, Method 20, Single Shear  
 NAS3353 Fixture, Bearing Surface Squareness Test, Self-Locking Nuts  
 NAS4445 Nut, Crimp, For CrimpLock Fastener System  
 NAS4450 Pin, Crimp Protruding Shear Head  
 NAS4452 Pin, Crimp, 100° Flush Shear Head  
 NAS4458 Pin, Crimp Protruding Tension Head  
 NAS4466 Pin, Crimp, 100° Crown Shear/Tension Head  
 NAS9800 Head Protrusion Gaging, 100° Flush Head Fasteners, Gage Block, Gage Diameters and Stylus  
 NASM25027 Nut, Self-Locking, 250 °F, 450 °F, and 800 °F

Copies can be obtained from the Aerospace Industries Association, 1000 Wilson Blvd., Suite 1700, Arlington, VA 22209. [www.aia-aerospace.org](http://www.aia-aerospace.org)

REVISION

6

**NAS4444**

SHEET 2

Document Sharing Hub

SAE International

|                    |                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AMS-QQ-P-416       | Plating, Cadmium (Electrodeposited)                                                                                                                                                                                                |
| AMS2416            | Nickel-Cadmium Plating, Diffused                                                                                                                                                                                                   |
| AMS2801            | Heat Treatment of Titanium Alloy Parts                                                                                                                                                                                             |
| AMS2700            | Passivation of CRES                                                                                                                                                                                                                |
| AMS2759            | Heat Treatment of Steels (Aircraft Practice), Process For                                                                                                                                                                          |
| AMS2770            | Heat Treatment of Aluminum Alloys                                                                                                                                                                                                  |
| AMS4967            | Titanium Alloy, Bars, Wire, Forgings, and Rings 6Al-4V Annealed, Heat treatable (UNS R56400)                                                                                                                                       |
| AMS5732            | Steel, Corrosion and Heat Resistant, Bars, Wire, Forgings, Tubing, and Rings 15Cr - 25.5Ni - 1.2Mo - 2.1Ti - .006B - .30V Consumable Electrode Melted 1800 Degrees F (982 °C) Solution and Precipitation Heat Treated (UNS S66286) |
| <del>AMS5735</del> | <del>Steel Bars, Forgings, Tubing and Rings, Corrosion and Heat Resistant</del>                                                                                                                                                    |
| AMS5737            | Steel Bars, Forgings, and Tubing, Corrosion and Heat Resistant                                                                                                                                                                     |
| AMS6300            | Steel Bars and Forgings .25Mo (.35 - .40C) (SAE 4037) (UNS G40370)                                                                                                                                                                 |
| AMS6322            | Steel Bars, Forgings, and Rings .50Cr - .55Ni - .25Mo (.38 - .43C) (SAE 8740) (UNS G87400)                                                                                                                                         |
| AMS6325            | Steel, Bars and Forgings .50Cr - .55Ni - .25Mo (.38 - .43C) (SAE 8740) Heat Treated, 105 KSI (724 MPa) Tensile Strength (UNS G87400)                                                                                               |
| AMS6327            | Steel Bars and Forgings .50Cr - .55Ni - .25Mo (.38 - .43C) (SAE 8740) Heat Treated, 125 KSI (862 MPa) Tensile Strength                                                                                                             |
| AMS6415            | Steel, Bars, Forgings, and Tubing .80Cr - 1.8Ni - .25Mo (.38 - .43C) (SAE 4340) (UNS G43406)                                                                                                                                       |
| AMS6484            | Steel, Bars, Forgings, and Tubing .80Cr - 1.8Ni - .25Mo (.38 - .43C) (SAE 4340) Normalized and Tempered                                                                                                                            |
| <del>AMS6485</del> | <del>Steel Bars and Forgings</del>                                                                                                                                                                                                 |
| AMS6487            | Steel Bars and Forgings, Premium Quality, Consumable Electrode Vacuum Melted                                                                                                                                                       |
| AMS-S-6758         | Steel, Chrome-Molybdenum (4130) Bars and Reforging Stock (Aircraft Quality)                                                                                                                                                        |
| AMS-H-81200        | Heat Treatment of Titanium and Titanium Alloys                                                                                                                                                                                     |
| AS8879             | Screw Threads, Controlled Radius Root with Increased Minor Diameter, General Specification For                                                                                                                                     |

Copies can be obtained from SAE International, 400 Commonwealth Dr., Warrendale, PA 15096-0001.

[www.sae.org](http://www.sae.org)

ASME International

|               |                                                        |
|---------------|--------------------------------------------------------|
| ASME B46.1    | Surface Texture (Surface Roughness, Waviness, and Lay) |
| ASME B107.100 | Flat Wrenches                                          |
| ASME B107.110 | Socket Wrenches, Handles, and Attachments              |

⑥

⑥

Copies can be obtained from ASME, Two Park Ave., New York, NY 10016-5990. [www.asme.org](http://www.asme.org)

⑥

Battelle Memorial Institute

MMPDS Metallic Materials & Elements for Aerospace Vehicle Structures

⑥

Copies can be obtained from Battelle Memorial Institute, 505 King Avenue, Columbus, OH 43201. [www.battelle.org](http://www.battelle.org)

### 3.0 REQUIREMENTS

General requirements are listed in the tables as follows:

|           |                                                             |
|-----------|-------------------------------------------------------------|
| Table I   | – General Requirements: H-11 Alloy Steel Crimp Pins         |
| Table II  | – General Requirements: 8740 or 4340 Alloy Steel Crimp Pins |
| Table III | – General Requirements: 6Al-4V Titanium Alloy Crimp Pins    |
| Table IV  | – General Requirements: All Materials for Crimp Nuts        |

- 3.1 Inspection tests. Inspection tests listed in Tables I, II, III and IV are mandatory (except as noted), on each lot as defined in 4.3.1, for fastener manufacturer. Tests which are not mandatory for the fastener manufacturer may be applied to any lot by the receiving contractor. Receiving contractor may apply any or all tests specified herein to any production lot of fasteners at any time.

REVISION

6



**NAS4444**  
SHEET 3

Document Sharing Hub

## 4.0 QUALITY ASSURANCE PROVISIONS

- 4.1 Qualification requirements. The fastener manufacturer shall be responsible for conducting qualification tests and furnishing part drawings, certified qualification test reports (if required by the purchaser) and test samples. The fasteners furnished under this specification shall be produced using the same manufacturing methods as used to produce fasteners that have passed qualification tests. The purchaser may apply any or all tests specified herein to any product represented as meeting this specification, at any time, to verify conformance.
- 4.1.1 Retention of qualification. To maintain product qualification status, manufacturers shall maintain on file, a certified qualification test report available for inspection by the procuring activity. The retention of a certified qualification test report by the manufacturer signifies that the manufacturer has demonstrated compliance to the qualification requirements of this specification. Products previously qualified through government-certified qualification tests and reports shall be considered qualified to this specification.
- 4.2 Acceptance inspection. Acceptance Inspection shall consist of tests per Table VIII.
- 4.3 Quality control. Quality control records pertaining to the specific work order, lot number or job number shall be available for inspection by the purchaser, for a period of 3 years after manufacturer's final inspection date.
- 4.3.1 Lot. The inspection lot shall consist of finished parts which are of the same part number, fabricated by the same process, heat treated together in one furnace load from the same heat of material and submitted for manufacturer's inspection at the same time.
- 4.3.2 Metallurgical examination shall consist of macro and micro examinations. Cross section of pins shall be taken as shown in Figure 6. Examine specimens at magnification indicated below:
- |                                                          |                                                                 |
|----------------------------------------------------------|-----------------------------------------------------------------|
| Thread Grain Flow .....                                  | Micro Examination (50x or greater)                              |
| Head Grain Flow.....                                     | Macro Examination                                               |
| Microstructure (Carburization and Decarburization) ..... | Micro Examination (25x or greater) or by Micro Hardness Testing |
| Discontinuities.....                                     | Macro or Micro Examination                                      |

## 5.0 PREPARATION FOR DELIVERY

- 5.1 Packaging. All fasteners shall be tightly packaged in unit type containers. Minimum requirements for unit containers are domestic class, single wall variety, Grade 200, corrugated fiberboard boxes as specified in specification ASTM D1974/D1974M and ASTM D5118/D5118M. Ample packing material shall be installed in each unit container to assure protection of parts from abrasion, chafing, damage, etc., during handling, transportation and storage.
- 5.2 Shipping containers. Fasteners of one inspection lot and part number shall be packaged in unit packages. An assortment of unit packages may be in larger containers. Containers must allow economical transportation and must conform to consolidated freight classification rules.
- 5.3 Marking. Minimum unit package marking shall include part number, name of manufacturer and manufacturer's inspection lot number. Marking shall be durable, legible and located so that it will not be damaged in shipping or when package is opened.

## 6.0 NOTES

- 6.1 (6) Assembled, torqued and crimped. The crimp nut is a self-contained, all metal, free-running 12-point nut. Sufficient torque is applied to take out any gap in the joint make-up. The nut is then crimped on the crimp pin with installation tooling as recommended by the manufacturer. This crimping action displaces a controlled volume of the nut material and induces an axial pull on the pin that results in a consistent clamping force on the joint. This crimping action converts the free-running nut, at installation, into a self-locking nut with an anti-rotation mechanical lock between pin and nut threads.
- 6.2 Joint assembly with the crimp nut installed, torqued and crimped on the crimp pin is the crimplock fastening system which provides for a complete and permanently fastened joint.

REVISION

6

**NAS4444**  
SHEET 4

- 6.3 Removal of the crimplock fastening system may require the destruction by cutting or splitting off the nut from the pin.
- 6.4 The use of either the crimp pin or crimp nut on any other bolt or nut, not defined herein, shall be the responsibility of the using agency. Such mixed combinations should be substantiated by tests employing joint and environmental characteristics with the resultant mechanical properties required of the design criteria.

TABLE I – GENERAL REQUIREMENTS: H-11 ALLOY STEEL CRIMP PINS

6

| Characteristics              | Engineering Requirements                                                                                                                                                                                                                                    | Testing Requirements (See 3.1)                                                                                                                                                          |                                                                 |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
|                              |                                                                                                                                                                                                                                                             | Test Method                                                                                                                                                                             | Sampling                                                        |
| Material                     | H-11 alloy steel (UNS T20811) per <del>AMS6485</del> AMS6487. Composition requirements apply to finished pins.                                                                                                                                              | As described by pin manufacturer to assure production parts conform to applicable specifications.                                                                                       |                                                                 |
| Dimensions                   | Per part standard drawings referencing this specification.                                                                                                                                                                                                  | Conventional measuring methods                                                                                                                                                          | ANSI/ASQ Z1.4 as classified per Table IX                        |
| Design & Construction        |                                                                                                                                                                                                                                                             | Conventional measuring methods                                                                                                                                                          | ANSI/ASQ Z1.4 as classified per Table IX                        |
| Head Protrusion (100° Heads) |                                                                                                                                                                                                                                                             | Test in accordance with NAS9800. The gaging shall be in accordance with Figure 1, except the dial indicator shall be set using the appropriate pin protrusion master gage per Figure 1. | Per NAS9800                                                     |
| Identification               |                                                                                                                                                                                                                                                             | Visual Examination                                                                                                                                                                      | ANSI/ASQ Z1.4, Level S-2, 2.5% AQL                              |
| Surface Texture              |                                                                                                                                                                                                                                                             | Per ASME B46.1                                                                                                                                                                          | ANSI/ASQ Z1.4, Level S-3, 1.5% AQL                              |
| Threads                      | Threads per AS8879, except major diameter per applicable part standard drawings referencing this specification. Threads may be rolled before heat treatment.                                                                                                | Gaging per AS8879                                                                                                                                                                       | ANSI/ASQ Z1.4, Level S-3, 1.5% AQL                              |
|                              | Runout and incomplete threads per Figure 5. Surface irregularities per Figure 3. Mechanical lock feature not considered to be a portion of threads.                                                                                                         | Comparator measurement, gaging and micro-examination                                                                                                                                    | ANSI/ASQ Z1.4, Level S-3, 1.5% AQL                              |
| Head To Shank Fillet         | Fillet shall be cold worked after all machining, grinding and heat treatment. Fillet shall conform to applicable part standard drawing and distortion limits per Figure 4.                                                                                  | Comparator measurement                                                                                                                                                                  | ANSI/ASQ Z1.4, Level S-3, 1.5% AQL                              |
| Heat Treatment               | Shall develop mechanical properties as defined herein, without adverse effect on metallurgical properties as defined herein. All pins shall be stress relieved at 50 °F ± 25 °F below the minimum tempering temperature for two hours after final grinding. | Test of shear, hardness and metallurgical properties verifies heat treatment.                                                                                                           | As applicable per test requirement.                             |
| Hardness                     | 156 KSI minimum shear, unless otherwise specified. Maximum Rockwell hardness not to exceed 54 HRC.                                                                                                                                                          | Hardness test per MIL-STD-1312-6 in accordance with NASM1312-6.                                                                                                                         | As required by the manufacturer to insure requirements are met. |
| Shear Strength               | Per Table V. Limitations per notes /a/ & /b/ beneath Table V.                                                                                                                                                                                               | Double or single shear performed per MIL-STD-1312-13 or MIL-STD-1312-20 in accordance with NASM1312-13 or NASM1312-20.                                                                  | Per Table VIII<br>REVISION<br>6                                 |



# NATIONAL AEROSPACE STANDARD

© COPYRIGHT 2019 AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC. ALL RIGHTS RESERVED



AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC  
1000 WILSON BLVD.  
ARLINGTON, VA 22209

THIS DRAWING SUPERSEDES ALL ANTECEDENT STANDARD DRAWINGS FOR THE SAME  
PRODUCT AND SHALL BECOME EFFECTIVE NO LATER THAN SIX MONTHS FROM THE LAST  
REVISION DATE.

FORM 18-01

REVISION

6

**NAS4444**

SHEET 6



Document Sharing Hub

USE OF OR RELIANCE UPON THIS DOCUMENT OR ANY NATIONAL AEROSPACE STANDARD IS ENTIRELY VOLUNTARY. AIA DOES NOT QUALIFY SUPPLIERS OR CERTIFY CONFORMANCE OF ITEMS PRODUCED UNDER NATIONAL AEROSPACE STANDARDS. AIA MAKES NO REPRESENTATION OR CLAIM RESPECTING (1) THE SUITABILITY OF ITEMS FOR ANY PARTICULAR APPLICATION OR (2) THE EXISTENCE OF OR APPLICABILITY THERETO OF PATENT OR TRADEMARKS RIGHTS.

TABLE I – GENERAL REQUIREMENTS: H-11 ALLOY STEEL CRIMP PINS (CONTINUED) <sup>6</sup>

| Characteristics           |         | Engineering Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Testing Requirements (See 3.1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                  |
|---------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
|                           |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Test Method                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Sampling                                                         |
| Test Nut                  |         | Unless otherwise specified, test nuts shall be as specified in Table VI.                                                                                                                                                                                                                                                                                                                                                                                                               | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Not applicable                                                   |
| Tension Strength          |         | Per Table VI. Limitations per notes /f/ & /g/ beneath Table VI.                                                                                                                                                                                                                                                                                                                                                                                                                        | Pin and test nut shall be assembled, torqued and crimped to values shown in Table VI. Tensile test per MIL-STD-1312-8 in accordance with NASM1312-8.                                                                                                                                                                                                                                                                                                                                                                                                          | Per Table VIII                                                   |
| Fatigue Test              |         | The installed fastener system shall be capable of passing life cycle requirements per Table XVII. Fatigue test not required on pins with thread size smaller than .1900-32.                                                                                                                                                                                                                                                                                                            | Pin and test nut shall be assembled, torqued and crimped to values shown in Table VI. Fatigue test performed per MIL-STD-1312-11 in accordance with NASM1312-11.                                                                                                                                                                                                                                                                                                                                                                                              | Per Table VII, not mandatory for acceptance inspection. See 3.1. |
| Metallurgical Examination |         | Cracks or voids are acceptable in the hexagon socket not to exceed the socket depth and which do not point towards the fastener head (See Figure 6). No cracks permitted in any other location. Other discontinuities permitted only as described in Table XII. A crack is defined as a clear crystalline break passing through the grain boundary without inclusion of foreign elements. Magnetic particle inspection is not required on pins with thread size smaller than .1900-32. | Shall be determined by magnetic particle inspection per ASTM E1444/E1444M or etched in any aqueous solution containing 50% (by volume) of hydrochloric acid held at 160 °F to 180 °F for a sufficient time to reveal macrostructure properly. The etched samples shall have all surfaces examined at 10x to 30x magnification. If the presence of discontinuities is detected, the samples with the greatest indications shall be mounted and micro-examined for conformance to Table XII. Inspection stamping of individual pins is not required. See 4.3.2. | Per Table VIII                                                   |
| Discontinuities           |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Metallurgical examination. See 4.3.2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Per Table VIII                                                   |
| Microstructure            |         | Shall be free from bursts, voids, overheating or gross alloy segregation.                                                                                                                                                                                                                                                                                                                                                                                                              | Metallurgical examination. See 4.3.2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Per Table VIII                                                   |
| Grinding Burns            |         | None permitted on shank, head to shank fillet or bearing surface of head.                                                                                                                                                                                                                                                                                                                                                                                                              | Examine pins for grinding burns during metallurgical examination. Nital etch inspect after stress relief (manufacturer's option).                                                                                                                                                                                                                                                                                                                                                                                                                             | Use samples from metallurgical examination.                      |
| Hydrogen Embrittlement    |         | Embrittlement relief not required for diffused nickel-cadmium plated pins.                                                                                                                                                                                                                                                                                                                                                                                                             | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Not applicable                                                   |
| Carburization             |         | No Carburization permitted.                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Metallurgical examination. See 4.3.2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Per Table VIII                                                   |
| Decarburization           |         | Decarburization shall not exceed .003 inches on any surface.                                                                                                                                                                                                                                                                                                                                                                                                                           | Metallurgical examination. See 4.3.2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Per Table VIII                                                   |
| Grain Flow                | Threads | Per Figure 2. Threads formed by single rolling process before heat treatment.                                                                                                                                                                                                                                                                                                                                                                                                          | Metallurgical examination. See 4.3.2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Per Table VIII                                                   |
|                           | Heads   | Per Figure 2. Formed by forging process before heat treatment.                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                  |
| Finish                    |         | Per part standard drawings referencing this specification.                                                                                                                                                                                                                                                                                                                                                                                                                             | Per applicable specification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Per Table VIII                                                   |
| Lubrication               |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Visual examination                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Not applicable                                                   |
| Preparation For Delivery  |         | See Section 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | N/A                                                              |

REVISION

6

NAS4444

SHEET 7



Document Sharing Hub

USE OF OR RELIANCE UPON THIS DOCUMENT OR ANY NATIONAL AEROSPACE STANDARD IS ENTIRELY VOLUNTARY. AIA DOES NOT QUALIFY SUPPLIERS OR CERTIFY CONFORMANCE OF ITEMS PRODUCED UNDER NATIONAL AEROSPACE STANDARDS. AIA MAKES NO REPRESENTATION OR CLAIM RESPECTING (1) THE SUITABILITY OF ITEMS FOR ANY PARTICULAR APPLICATION OR (2) THE EXISTENCE OF OR APPLICABILITY THERETO OF PATENT OR TRADEMARKS RIGHTS.

TABLE II – GENERAL REQUIREMENTS: 8740 (UNS G87400) or 4340 (UNS G43400) ALLOY STEEL CRIMP PINS <sup>6</sup>

| Characteristics              | Engineering Requirements                                                                                                                                                                                                                                                        | Testing Requirements (See 3.1)                                                                                                                                                          |                                                                 |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
|                              |                                                                                                                                                                                                                                                                                 | Test Method                                                                                                                                                                             | Sampling                                                        |
| Material                     | 8740 (UNS G87400) per MIL-S-6049 AMS6322, AMS6325, or AMS6327; or 4340 (UNS G43400) per MIL-S-5000 AMS6415 or AMS6484 (mfg.'s option). Composition requirements apply to finished pins.                                                                                         | As described by pin manufacturer to assure production parts conform to applicable specifications.                                                                                       |                                                                 |
| Dimensions                   | Per part standard drawings referencing this specification.                                                                                                                                                                                                                      | Conventional measuring methods                                                                                                                                                          | ANSI/ASQ Z1.4 as classified per Table IX                        |
| Design & Construction        |                                                                                                                                                                                                                                                                                 | Conventional measuring methods                                                                                                                                                          | ANSI/ASQ Z1.4 as classified per Table IX                        |
| Head Protrusion (100° Heads) |                                                                                                                                                                                                                                                                                 | Test in accordance with NAS9800. The gaging shall be in accordance with Figure 1, except the dial indicator shall be set using the appropriate pin protrusion master gage per Figure 1. | Per NAS9800                                                     |
| Identification               |                                                                                                                                                                                                                                                                                 | Visual Examination                                                                                                                                                                      | ANSI/ASQ Z1.4, Level S-2, 2.5% AQL                              |
| Surface Texture              |                                                                                                                                                                                                                                                                                 | Per ASME B46.1                                                                                                                                                                          | ANSI/ASQ Z1.4, Level S-3, 1.5% AQL                              |
| Threads                      | Threads per AS8879, except major diameter per applicable part standard drawings referencing this specification. NAS4458S and NAS4466S threads rolled after all heat treatment. NAS4450S and NAS4452S threads rolled before or after all heat treatment (manufacturer's option). | Gaging per AS8879                                                                                                                                                                       | ANSI/ASQ Z1.4, Level S-3, 1.5% AQL                              |
|                              | Runout and incomplete threads per Figure 5. Surface irregularities per Figure 3. Mechanical lock feature not considered to be a portion of threads.                                                                                                                             | Comparator measurement, gaging and micro-examination.                                                                                                                                   | ANSI/ASQ Z1.4, Level S-3, 1.5% AQL                              |
| Head To Shank Fillet         | Fillet shall be cold worked after all machining, grinding and heat treatment. Fillet shall conform to applicable part standard drawing and distortion limits per Figure 4.                                                                                                      | Comparator measurement                                                                                                                                                                  | ANSI/ASQ Z1.4, Level S-3, 1.5% AQL                              |
| Heat Treatment               | Shall develop mechanical properties as defined herein, without adverse effect on metallurgical properties as defined herein. All pins shall be stress relieved at 50 °F ± 25 °F below the minimum tempering temperature for two hours after final grinding.                     | Test of shear, hardness and metallurgical properties verifies heat treatment.                                                                                                           | As applicable per test requirement.                             |
| Hardness                     | 108 KSI minimum shear, unless otherwise specified. Maximum Rockwell hardness not to exceed 44 HRC.                                                                                                                                                                              | Hardness test per MIL-STD-1312-6 in accordance with NASM1312-6.                                                                                                                         | As required by the manufacturer to insure requirements are met. |
| Shear Strength               | Per Table V. Limitations per /a/ & /b/ beneath Table V.                                                                                                                                                                                                                         | Double or single shear performed per MIL-STD-1312-13 or MIL-STD-1312-20 in accordance with NASM1312-13 or NASM1312-20.                                                                  | Per Table VIII                                                  |
| Test Nut                     | Unless otherwise specified, test nuts shall be as specified in Table VI.                                                                                                                                                                                                        | Not applicable                                                                                                                                                                          | Not applicable                                                  |

REVISION

6

**NAS4444**  
SHEET 8



Document Sharing Hub

USE OF OR RELIANCE UPON THIS DOCUMENT OR ANY NATIONAL AEROSPACE STANDARD IS ENTIRELY VOLUNTARY. AIA DOES NOT QUALIFY SUPPLIERS OR CERTIFY CONFORMANCE OF ITEMS PRODUCED UNDER NATIONAL AEROSPACE STANDARDS. AIA MAKES NO REPRESENTATION OR CLAIM RESPECTING (1) THE SUITABILITY OF ITEMS FOR ANY PARTICULAR APPLICATION OR (2) THE EXISTENCE OF OR APPLICABILITY THERETO OF PATENT OR TRADEMARKS RIGHTS.

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.  
1000 WILSON BLVD.  
ARLINGTON, VA 22209

THIS DRAWING SUPERSEDES ALL ANTECEDENT STANDARD DRAWINGS FOR THE SAME PRODUCT AND SHALL BECOME EFFECTIVE NO LATER THAN SIX MONTHS FROM THE LAST REVISION DATE.

FORM 18-01