CHANGE NOTICES ARE NOT CUMULATIVE
AND SHALL BE RETAINED UNTIL SUCH
TIME AS THE ENTIRE STANDARD IS REVISED.

MIL-STD-1515A
NOTICE 2
5 June 1981

MILITARY STANDARD

FASTENER SYSTEMS FOR AEROSPACE APPLICATIONS

TO ALL HOLDERS OF MIL-STD-1515A:

1. THE FOLLOWING ITEMS OF MIL-STD-1515A HAVE BEEN REVISED AND SUPERSEDE THE ITEMS LISTED:

NEW ITEM	DATE	SUPERSEDED ITEM	DATE	TYPE CHANGE
Page iii	24 September 1979	REPRINTED WITHOUT CHANGE		
Page iv	5 June 1981	Page iv	24 September 1979	Major
Page v	5 June 1981	Page v	24 September 1979	Major
Page vi	12 July 1978	REPRINTED WITHOUT CHANGE		
Page 1	5 June 1981	Page 1	12 July 1978	Minor
Page 2	24 September 1979	REPRINTED WITHOUT CHANGE		
Req 113	5 June 1981	Req 113	12 July 1978	Major
Req 115	Deleted Entirely	Req 115	12 July 1978	
Req 121	5 June 1981	Req 121	12 July 1978	Major
Req 128	5 June 1981	INITIAL PUBLICATION		
Req 129	5 June 1981	INITIAL PUBLICATION		
Req 206	5 June 1981	INITIAL PUBLICATION		

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-STD-1515A will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the Military Standard is completely revised or cancelled.

Custodians:
Army - AV
Navy - AS
Air Force - 11

Review Activities:
Army - AR, MI
Navy -
Air Force - 10, 99
DLA - IS

Preparing Activity:
Air Force - 11

Project No. 53GP-0039-14

FSC 53GP

FOREWORD

The purpose of this document is to establish standardization in the selection, development, and use of aerospace fastening systems, including hole characteristics and inspection criteria. Existing fasteners cover a wide variety of configurations, sizes, materials, and finishes. Various aerospace fastener systems have common fastener needs but lack defined application exchangeability. This document provides contractual design requirements and guidelines for proper selection and application of approved fastening systems. The basic objectives of this standard can be summarized as:

> To document selection and application information for approved fastening systems and procedures so the designer can achieve an optimum balance of performance, reliability, and exchangeability with minimum cost, logistic inventory and maintenance.

Selections and procedures are limited to those listed herein.

CONTENTS

INTRODUCTORY SECTION

SECTION 100 - GENERAL DESIGN REQUIREMENTS

[a] Requirement not yet published as of the date of this basic document.

[b] Denotes change.

[c] Noncontractual requirement.

Supersedes page iv of 24 September 1979

CONTENTS (Continued)

SECTION 200 - STRUCTURAL FASTENER REQUIREMENTS

[a] Requirement not yet published as of the date of this basic document.

[b] Denotes change.

[c] Proposed Sections.

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FASTENER SYSTEMS FOR AEROSPACE APPLICATIONS

1. SCOPE

1.1 Scope. This standard covers the methods of fastening, materials, finishes, test methods, and hole size and criteria of fasteners and fastening systems used in the design and construction of aerospace systems. In addition, * it identifies a comprehensive presentation of engineering practices, procedures, processes, and characteristics for fasteners.

1.2 Purpose. The purpose of this standard is to document selection and application information for approved fastening systems and procedures so the designer can achieve an optimum balance of performance, reliability, and exchangeability with minimum cost, logistic inventory, and maintenance.

2. APPLICABLE DOCUMENTS

2.1 Issues of Documents. The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this standard to the extent specified herein.

STANDARDS

MILITARY

MS 17855 Fasteners, Screw Threaded, Descriptive Factor Symbols and Order of Notes for Engineering Documents for

2.2 Referenced Documents. A list of referenced documents is presented in the individual requirements contained in this standard. The applicable issues shall be those in effect on the date of the invitation for bids or request for proposal.

2.2.1 Nongovernment Documents. Nongovernment documents referenced herein show the specific issue applicable. Other revisions are not applicable.

2.2.2 Sources for Nongovernment Documents. Addresses for obtaining documents referenced herein but not obtainable from the Government are as follows:

AMS, AS, ARP, AIR, AMD
Society of Automotive Engineers, Inc.
400 Commonwealth Drive
Warrendale, PA 15096

ANSI
American National Standards Institute
1430 Broadway
New York, NY 10018

ASTM
American Society for Testing and Materials
1916 Race Street
Philadelphia, PA 19103

* Denotes change.

Supersedes page dated 12 July 1978

** NAS National Standards Association, Inc.
4827 Rugby Avenue
Washington, DC 20014

3. DEFINITIONS

3.1 Definitions applicable to complete standard. The definitions provided in this document shall be for those special words, phrases, or usages which are peculiar to the fastenings area. This paragraph contains definitions (as defined above) for those words which are found in three or more requirements. Definitions for words used in only one or two requirements will be found with the particular requirement.

3.1.1 Airframe structure. In the context of this document, the airframe structure includes the fuselage, wing, and empennage.

3.1.2 Allowables. (See design allowables.)

3.1.3 Anchor nut (plate nut). A nut that resists turning during bolt installation by being attached to, or contained in, one or more of the parts being assembled.

3.1.4 Approved fastener. A fastener that is listed in this document.

3.1.5 Bearing face. (See bearing surface.)

3.1.6 Bearing surface. The load-carrying surface of a fastener or structural component.

3.1.7 Blind fastener. A fastening system which is installed from one side of the structure.

3.1.8 Chamfer. A beveled surface on a component to facilitate entry of one part into the other. A beveled surface on a component to eliminate a sharp corner.

3.1.9 Critical application. Any application of a fastener where loss or failure of the fastener could cause one or more of the following:

a. Loss of aircraft.

b. Preclusion of continued flight and landing within the design limitations of the aircraft using normal pilot skill and strength.

c. Significant injury to the occupants of the aircraft or ground personnel.

d. Rendering of major subsystems or special mission systems inoperative or causing its destruction.

3.1.10 Design allowables. Tensile and shear ultimate strengths of fasteners and shear ultimate and yield strengths of mechanically fastened joints used for design of aircraft joint structures.

** Denotes change

Supersedes page dated 12 July 1978

IDENTIFICATION MARKING

1. Purpose. This requirement shall establish the methods and procedures for the identification marking of fasteners.

2. Documents applicable to Requirement 113.

H4-1/H4-2	Federal Supply Code for Manufacturers
MIL-STD-1291	Identification Symbols for Aerospace Fastener Manufacturers
AS 478	Identification Marking Methods
NAS 1347	Identification of Fasteners

3. Fastener marking

* 3.1 Approved fasteners. Approved fasteners shall be identification marked in accordance with the applicable specification, standard, or part drawing. Other fasteners submitted for release which have no identification marking specified with their item's identification, standard, or part drawing shall be identification marked in accordance with NAS 1347, Type IV, markings. Permanent markings and marking methods shall be in accordance with AS 478.

* 3.1.1 Manufacturer's identification. All fasteners shall be marked with the actual manufacturer's name or manufacturer's identification symbol listed in MIL-STD-1291 and/or the manufacturer's identification number per H4-1/H4-2. Those manufacturers not listed and who desire to be listed in MIL-STD-1291 should submit their identification symbol, Federal Supply Code for Manufacturers (FSCM), and company address and telephone number to the preparing activity (listed below) for approval. Nongovernment codes (FSCNM) which contain alpha letters are not acceptable.

MIL-STD-1291 (Preparing Activity)

US Army Aviation Research & Development Command
ATTN: DRDAV-ERS
4300 Goodfellow Blvd
St. Louis, MO 63120

Application requests for FSCM, for the purpose of symbol listing in MIL-STD-1291.

US Army Troop Support and Aviation
Material Readiness Command
ATTN: DRSTS-SLD
4300 Goodfellow Blvd
St. Louis, MO 63120

* Denotes change.

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THREADS IN BEARING

* 1. Purpose. This requirement establishes the limits for threads in bearing in members joined with the fastener loaded in shear.

2. Documents applicable to Requirement 121.

Not applicable.

* 3. Requirements. Structural bolts loaded in shear shall have sufficient grip length so that no threads are in bearing.

* Denotes change.

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DESIGN REQUIREMENTS FOR *CAPTIVE SCREWS*

1. Purpose. This requirement covers the basic design and engineering requirements for captivated screws in aerospace systems and related equipment. A captive screw is defined as a threaded fastening device that is captivated to the outer panel or access door and is attached to the sub-structure by use of mating hardware such as nuts, plate nuts, inserts, tapped holes, etc. For panel fastener usage refer to Requirement 129.

1.1 Application. These fasteners may be used for the attachment of equipment, inspection doors, panels, servicing accommodations, instruments and similar areas where loss of mounting hardware would contribute to maintenance difficulty or down time.

1.2 Classification. Captive screws shall be of the following types and classes, or combinations thereof:

a. Type I fully captive screws. Type I screws shall be inseparable assemblies incapable of removal either from their retainer or from their associated panels without the use of special tools.

b. Type II semi-captive screws. Type II screws shall be capable of removal from their retainers or the retainers shall be capable of removal from their associated panels without use of special tools. Type II screws shall be single lead threads only.

c. Class 1 fixed captive screws. Class 1 screws shall be fixed in position in the mounting hole and shall not have a means of moving laterally to make up for misalignment in the attaching holes.

d. Class 2 floating captive screws. Class 2 screws shall have a means of providing radial movements about the mounting hole so as to compensate for misalignment between the holes in the upper and lower panels.

2. Documents applicable to Requirement 128.

QQ-P-35	Passivation Treatments for Corrosion-Resisting Steel
QQ-P-416	Plating, Cadmium (Electrodeposited)
MIL-C-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-S-8879	Screw Threads, Controlled Radius Root With Increased Minor Diameter, General Specification For
MIL-C-81562	Coatings, Cadmium, Tin-Cadmium and Zinc (Mechanically Deposited)
MIL-C-83488	Coating, Aluminum, Ion Vapor Deposited
FED-STD-H28	Screw-Thread Standard for Federal Services
NAS672	Plating High Strength Steels, Cadmium
AMS2401	Cadmium Plating, Low Hydrogen Content Deposit

3. Design, usage limitations, and tests

3.1 Drive or wrenching element. The drive or wrenching element in the head of the screw shall be limited to those specified in Requirement 120 except as herein specified. The drive or wrenching element selected shall be of a design that meets performance requirements demanded by the installation and its maintainability. The drive or wrenching element may vary to be consistent in type with other surrounding maintenance demands.

3.2 Float. The captive screw may have float built into its design (Class 2) or installation method or may be rigidly fixed to the panel (Class 1). The amount of float depends upon the design but shall be .020 inch minimum radially for Class 2 screws.

3.3 Threads. Threads may be single, double, or quadruple lead in accordance with FED-STD-H28 or MIL-S-8879, depending upon design requirements.

3.4 Protective treatment. Components of alloy steel shall be cadmium plated or aluminum coated in accordance with one of the following documents:

Cadmium Plating	Aluminum Coating
QQ-P-416 MIL-C-81562 NAS672 AMS2401	MIL-C-83488

Aluminum alloy parts shall be anodized in accordance with MIL-A-8625 or chemically treated in accordance with MIL-C-5541. Corrosion resistant materials shall be passivated in accordance with QQ-P-35 or shall be provided with a surface treatment compatible with the environmental requirements of the particular application.

3.5 Head markings. Shall be in accordance with the applicable standard drawing.

4. Performance. The minimum performance criteria for captive screws is indicated by requirements of the individual application. However, some basic minimum requirements are listed below.

4.1 Tensile and shear strength. Both classes of captive screws must have the capability to carry the desired tensile or shear load for a given application.

4.2 Fastener push-out. The retention method used for captive screws shall resist axial push-out values listed below:

SCREW SIZE	LBS. MIN.	SCREW SIZE	LBS. MIN.
.1120-40	40	.1900-32	100
.1380-32	60	.2500-28	125
.1640-32	80		

4.3 Clamp up. Captive screws shall be capable of inducing the minimum clamp up loads listed below:

SCREW SIZE	LBS. MIN. SINGLE LEAD	LBS. MIN. DOUBLE LEAD	LBS. MIN. QUAD. LEAD
.1120-40	150	75	
.1380-32	250	125	
.1640-32	400	200	100
.1900-32	700	350	175
.2500-28	1300	650	325

4.4 Retractibility. Where applicable, the captive screw design shall demonstrate its capability of being retracted free of the substructure.

4.5 Corrosion resistance. Captive screws shall demonstrate the required corrosion resistance when tested to the applicable specification.

5. Tooling. Use tooling as recommended by the applicable manufacturer.

6. Intended use and guidance criteria.

a. Captive screws may be used to secure any panel, door, or other fastener retained device which must be routinely opened or released for maintenance, service, or equipment adjustment.

b. These fasteners may be used where the loss of attaching hardware could cause loss of system integrity, whether structural or electronic, or could endanger system operating personnel.

c. They should be used where extensive equipment tear down for the retrieval of ordinary attaching hardware would be required, should such fasteners be dropped therein.

6.1 General use. Type I screws are preferred for general use and for use where replacement is not anticipated during the life of the system.

6.2 Anchor nuts. Class 1 screws are preferred for use with floating anchor nuts or similar mating parts which provide radial misalignment capability. Class 2 screws are intended to engage fixed anchor nuts, inserts, or tapped holes.

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DESIGN REQUIREMENTS FOR PANEL FASTENERS

1. Purpose. This requirement establishes and defines the basic design and engineering requirements for the design of panel fastener assemblies for attaching structural load-carrying and nonstructural panels, inspection doors, quickly detachable plates, control and instrument panels and equipment rack systems.

1.1 Classification. Panel fasteners shall be of the following types and classes:

Type I - Structural (high-strength, stressed-panel fasteners)
Type II - Nonstructural
Type III - Nonstructural strip instrument panel fasteners

Class 1 - Floating receptacle
Class 2 - Fixed receptacle

2. Documents applicable to Requirement 129.

QQ-P-35	Passivation Treatments for Corrosion-Resisting Steel
QQ-P-416	Plating, Cadmium (Electrodeposited)
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-C-8837	Coating, Cadmium (Vacuum Deposited)
MIL-C-81562	Coating, Cadmium, Tin-Cadmium and Zinc (Mechanically Deposited)
AMS2401	Cadmium Plating, Low Hydrogen Content Deposit
NAS672	Plating High Strength Steels, Cadmium

3. Design and construction.

a. Type I fasteners shall be of the stud type with a mating receptacle design. These are high strength and high reuse fasteners which shall not disassemble during the predetermined flight parameters of the vehicle operations. This type of fastener shall provide for retention of the stud assembly in the outer sheet when disengaged from the receptacle.

b. Type II fasteners shall be of the stud type with a mating receptacle design. These are nonstructural type fasteners that provide lower load-carrying capabilities and permit rapid panel installation and removal. This type of fastener shall provide for retention of the stud assembly in the outer sheet when disengaged from the receptacle.

c. Type III fasteners shall be of the stud strip receptacle type. These low strength strip type fasteners permit rapid installation and removal of instrumentation and edge lighted panels. When the fastener is unlocked or open, the stud assembly is retained by the outer structure.

3.1 Material. The material shall be of a quality suitable to meet the performance characteristics and mechanical properties intended.

3.2 Stud assembly. The stud assembly configuration may employ a shear bushing, sleeve bolt, retainer ring or other components.

3.2.1 Driving recess. The recess in the head of the stud or sleeve bolt shall be limited to those specified in Requirement 120 except that the preferred recess for Type I fasteners shall be hex type and Type II and Type III may be slotted. For Type II and Type III fasteners, with the fastener in the locked or installed position, the slot or other index mark shall be so oriented as to indicate engagement of the fastener.

3.2.2 Head flushness

3.2.2.1 Type I fasteners. Flush-head studs or sleeve bolts and grommets shall be capable of being installed flush with the outer panel within ±0.015 inch when installed in any grip within the grip range of the fastener. In designs utilizing a shear bushing type component, the stud head shall be flush with the top of the shear bushing within ±0.015 inch when seated.

3.2.2.2 Type II fasteners. Flush-head studs shall be capable of being installed flush with the surface of the outer panel within ±0.015 inch when installed in the nominal grip for component, the stud head shall be flush with the top of the bushing or grommet within ±0.015 inch when installed in nominal grip and locked.

3.2.3 Locking. Stud locking of Type II and III fasteners shall be accomplished within approximately 1/4 turn of rotation (for rotary types) after engagement with the locking means of the receptacle.

3.2.4 Stud retention. Stud retention may generally be accomplished by a retaining ring or captivated sleeve. The design may be unique due to stud configuration and need not conform to Requirement 216.

3.2.4.1 Counterbore. The counterbore in either faying surface of the panel or substructure shall be capable of containing the retaining ring, when used, without pinching or cocking. A metallic spacer may be attached to either surface in lieu of counterboring the structure.

3.2.4.2 Spacers. A spacer or similar device is required in form-in-place gasket applications to limit extrusion of the gasket. A form-in-place gasket shall not substitute for a spacer or counterbore.

3.3 Receptacle assembly

3.3.1 Type I fasteners. The receptacle shall be either of the floating type (Class 1) having a minimum radial float of 0.020 inch or of the fixed type (Class 2) having no radial float. The receptacle may be open ended, closed or capped. The floating element (Class 1) should be capable of being replaced without removing its retainer except for fuel area or sealing configuration.

3.3.2 Type II fasteners. The receptacle shall be either of the floating type (Class 1) having a minimum radial float of 0.030 inch or of the fixed type (Class 2) having no radial float.

3.3.3 Type III fasteners. The nut (receptacle) strip shall provide for mounting holes and receptacle holes at increments of 0.375 inch. The tolerance on spacing shall be ±0.002 inch.

3.3.4 Installation. The receptacle may be attachable by means of rivets, projection welds, or other means. If weld projections are specified, the spacing of the projections shall be the same as specified for the rivet holes. Sheet preparation for product installations shall be determined by the design requirements of the application.

3.4 Threads. Threads, where employed, may be single, double or quadruple lead depending upon the specific manufacturer's design. Internal threads, in the area of self-locking, may be deformed or displaced in any manner in order to meet the self-locking and reuse requirements of the product specification without damage to finish or recess drive.

3.5 Protective treatment

3.5.1 Alloy steel. Alloy steel components shall be cadmium plated in accordance with QQ-P-416, MIL-C-8837, NAS672, MIL-C-81562, or AMS2401.

3.5.2 Aluminum alloy. Aluminum alloy parts shall be anodized in accordance with MIL-A-8625.

3.5.3 Corrosion resistant steel. Corrosion resistant steel shall be passivated in accordance with QQ-P-35 or shall be provided with a finish compatible with the environmental and temperature requirements of the particular application.

3.6 Lubrication. Dry film lubricants, when required, shall be as specified in Requirement 103.

3.7 Size selection. For Type I panel fasteners, the preferred size is 3/8 inch nominal diameter.

4. Performance characteristics. The minimum performance criteria for panel fasteners are dictated by requirements of the individual airframe design. Definition of application requirements shall determine the tests for the fastener manufacturer or airframe manufacturer to substantiate required attributes. The tests could include, but are not limited to, the following:

a. Locking and unlocking torque
b. Prevailing torque
c. Torque out
d. Stud or sleeve bolt push out
e. Receptacle push out
f. Sheet pull up
g. Simulated installation without and with hole mismatch
h. Curved sheet installation
i. Sealing
j. Endurance or reusability
k. Vibration
l. Elevated temperature
m. Corrosion resistance
n. Sheet separation
o. Tension
p. Shear

5. Mechanical properties. The mechanical properties of a panel fastener assembly are not the strength capability of the individual components, but also a function of the strength and thickness of the panel material. Consequently, the end use shall also influence the tests established by the manufacturer or user.

6. Notes

6.1 Interchangeability. All parts that have the same manufacturer's part number shall be directly and completely interchangeable with each other, with respect to installation, performance, and integral components. Changes in manufacturer's part number shall be governed by the drawing number requirements as specified in DOD-STD-100.

6.2 Marking. Except where limited by configuration, the stud and receptacles shall be marked with the manufacturer's identification in accordance with MIL-STD-1291. In addition, the stud shall be identified with the grip length on the head end. All marking shall be depressed.

SOLID RIVETS

1. Purpose. This requirement provides the engineering criteria, requirements, and design and usage limitations for the selection and use of solid rivets in aerospace mechanical fastening systems.

2. Documents applicable to Requirement 206.

MS9403	Rivet, Solid-Universal Head, AMS5737
MS9460	Rivet, Solid - 100° Flush Head, AMS7235
MS20426	Rivet, Solid, Countersunk 100°, Precision Head, Aluminum and Aluminum Alloy
MS20427	Rivet, Solid 100° Countersunk Head, Carbon Steel Corrosion-Resistant Steel, Monel and Copper
MS20470	Rivet, Solid-Universal Head, Aluminum and Alumimum Alloy
MS20613	Rivet, Solid-Universal Head, Steel, Carbon and Steel, Corrosion-Resistant
MS20615	Rivet, Solid-Universal Head, Brass, Copper and Nickel-Copper Alloy
AN123151 thru AN123300	Rivet, Solid, Universal Head, AMS7229
AN123301 thru AN123450	Rivet, Solid, Universal Head, AMS7232
AN123451 thru AN123600	Rivet, Solid, 100° Flush Head, AMS7229
AN123601 thru AN123750	Rivet, Solid, 100° Flush Head, AMS7232
NAS1097	Rivet, Solid - 100° Flush Shear Head, Aluminum Alloy
NAS1198	Rivet - Solid Universal Head, A286 Corrosion Resistant Steel
NAS1199	Rivet - Solid - 100° Flush Head A286 Corrosion Resistant Steel
NAS1200	Rivet, Solid, 100° Flush Shear Head A286 Corrosion Resistant Steel and Monel

3. Design and usage limitations. Solid rivets in this requirement shall be subject to the following design and usage limitations:

a. Do not use cadmium-plated rivets where temperatures may exceed 450°F. Cadmium-plated monel rivets may not be used in applications where temperatures exceed 400°F.

b. Do not use cadmium-plated or silver-plated rivets in titanium.

c. The primary loading rivets shall be shear.

d. Head configuration shall be in accordance with Requirement 106. Where an angle other than 100° is needed, contact the procuring activity for approval of the specific application.

e. Edge distant (center of hole to edge of sheet) for the location of rivets in sheets shall be a minimum of 2D. (D = rivet diameter.)

4. Design, selection and approved call-out. Fasteners in the category established by this requirement shall be selected from and called out by part numbers specified on standards listed in section 2.

5. Tooling. Rivets shall be driven utilizing tools that conform to acceptable aerospace practices for the rivet size and material being upset.

6. Intended use and guidance criteria. This paragraph is not contractual. It is intended to provide guidance to designers for the application and selection of solid rivets.

6.1 Aluminum alloy 2024 ("Type DD") rivets should be driven immediately after quenching or refrigeration. These require special care when driving to avoid or minimize upset cracking. See figure 206-1 for allowances.

6.2 When using rivet material harder than the material to be joined, particular care should be taken to avoid distortion during riveting. Special care is recommended when selecting rivet types and materials for installation through nonmetallic structures. Soft materials may be riveted by using washers under the rivet upset trail.

6.3 To minimize galvanic corrosion in the joint, rivets should not be anodic to the most anodic material in the joint.

6.4 Spotfacing should be used to provide a flat surface under upset heads when:

6.4.1 The surface slope is greater than 8° under the upset head of rivets. (Because of fatigue considerations, tapered shims may be used to avoid counterbores.)

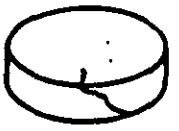
6.4.2 A curved surface has a radius less than three times the rivet shank diameter.

6.4.3 The roughness of the facing surface under the heads is greater than 500 RHR.

6.5 Do not use solid rivets where forces required to upset the solid rivet can be detrimental to the structure.

6.6 Minimum spacing for riveted joints should be 4D between fasteners in the same adjacent rows or in staggered patterns except in fuel tight areas where the minimum spacing should be 3D. (D = rivet diameter.)

6.7 Tables 206-I and 206-II are presented as an aid in the selection of solid rivets.



Acceptable provided cracks do not extend within a circle concentric with and having a diameter approximately 1.1 times the shank diameter.

Acceptable provided cracks do not extend within a circle concentric with and having a diameter approximately 1.1 times the shank diameter.

Acceptable provided cracks do not extend within a circle concentric with and having a diameter approximately 1.1 times the shank diameter and provided the cracks do not tend to intersect so as to be a potential cause of a section of the head chipping out.

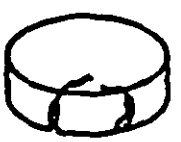
Acceptable provided cracks do not extend within a circle concentric with and having a diameter approximately 1.1 times the shank diameter and provided the cracks do not tend to intersect so as to be a potential cause of a section of the head chipping out.

Not Acceptable.

Not Acceptable.

Not Acceptable.

Not Acceptable.



Not Acceptable.

Not Acceptable.

FIGURE 206-1. Formed head inspection criteria.

TABLE 206-I. Rivet, solid, flush head.

DRAWING NUMBER	MATERIAL	FINISH	ROOM TEMPERATURE ULTIMATE SHEAR STRENGTH, AS RECEIVED, PSI	* MINIMUM TEMPERATURE
100°COUNTERSUNK AN123451 thru AN123600	CRES, 300 Series	None	48,000 (MIN)	600°F
AN123601 thru AN123750	Ni Alloy	None	51,000 (MIN)	1800°F
MS9460-( )	CRES, A-286	None	80,000 to 95,000	1200°F
MS20426A( )-( )	Al, 1100-F	None	No Shear Test Required	250°F
MS20426B( )-( )	Al, 5056-1132	Anodized or Chemically Surface Treated	24,000 (MIN)	250°F
MS20426AD( )-( )	Al, 2117-T4	Anodized or Chemically Surface Treated	26,000 (MIN)	250°F
MS20426DD( )-( )	Al, 2024-T4	Anodized	37,000 (MIN)	250°F

TABLE 206-I. Rivet, solid, flush head. - Continued

DRAWING NUMBER	MATERIAL	FINISH	ROOM TEMPERATURE ULTIMATE SHEAR STRENGTH, AS RECEIVED, PSI	* MINIMUM TEMPERATURE
MS20427-( )C( )	Steel, C1010-C1015	Cd Plated	32,000 to 38,000	450°F
MS20427F( )-( )	CRES, 300 Series	None	65,000 to 85,000	600°F
MS20427M( )-( )	Monel	None	49,000 to 59,000	800°F
MS20427M( )C( )	Monel	Cd Plated	49,000 to 59,000	400°F
MS20427C( )-( )	Copper, Annealed	None	23,000 to 27,000	300°F
NAS1199-( )-( )	CRES, A-286	Passivated	85,000 to 95,000	1200°F
100°SHEAR HEAD NAS1097B( )-( )	Al, 5056-1132	Anodized or Chemically Surface Treated	24,000 (MIN)	250°F
NAS1097AD( )-( )	Al, 2117-T4	Anodized or Chemically Surface Treated	26,000 (MIN)	250°F
NAS1097D( )-( )	Al, 2017-T4	Anodized or Chemically Surface Treated	33,000 (MIN)	250°F
NAS1097DD( )-( )	Al, 2024-T4	Anodized	37,000 (MIN)	250°F

TABLE 206-I. Rivet, solid, flush head. - Continued

DRAWING NUMBER	MATERIAL	FINISH	ROOM TEMPERATURE ULTIMATE SHEAR STRENGTH, AS RECEIVED, PSI	* MINIMUM TEMPERATURE
NAS1200-( )-( )	CRES, A-286	Passivated	85,000 to 95,000	1200°F
NAS1200M( )-( )	Monel	None	49,000 tr 59,000	800°F
NAS1200M( )-( )P	Monel	Cd Plated	49,000 to 59,000	400°F

* Maximum temperature column is for information/guidance only. Some rivets may sustain strength for only a few seconds at these temperatures. Consequently, it is recommended that consideration be given to the time-at-temperature characteristics of each material specified in Table 206-I to avoid severe degrading of rivets at maximum temperature exposure.

TABLE 206-II. Rivet, solid, universal head.

DRAWING NUMBER	MATERIAL	FINISH	ROOM TEMPERATURE ULTIMATE SHEAR STRENGTH, AS RECEIVED, PSI	* MINIMUM TEMPERATURE
AN123151 thru AN123300	CRES, 300 Series	None	48,000 (MIN)	600°F
AN123301 thru AN123450	Ni Alloy	None	51,000 (MIN)	1800°F

TABLE 206-II. Rivet, solid, universal head. - Continued

DRAWING NUMBER	MATERIAL	FINISH	ROOM TEMPERATURE ULTIMATE SHEAR STRENGTH, AS RECEIVED, PSI	* MINIMUM TEMPERATURE
MS9403-( )	CRES, A-286	None	80,000 to 95,000	1200°F
MS20470A( )-( )	Al, 1100-F	None	No Shear Test Required	250°F
MS20470B( )-( )	Al, 5056-1132	Anodized or Chemically Surface Treated	24,000 (MIN)	250°F
MS20470AD( )-( )	Al, 2117-T4	Anodized or Chemically Surface Treated	26,000 (MIN)	250°F
MS20470D( )-( )	Al, 2017-T4	Anodized or Chemically Surface Treated	33,000 (MIN)	250°F
MS2047DD( )-( )	Al, 2024-T4	Anodized	37,000 (MIN)	250°F
MS20613-( )P( )	Steel, C1005-C1015	Cd Plated	25,000 to 42,000	450°F
MS20613-( )C( )	CRES, 300 Series	Passivated	65,000 to 85,000	600°F
MS20615-( )B( )	Brass, 1/8 Hard	None	35,000	300°F
MS20615-( )Cu( )	Copper, Annealed	None	17,000 to 30,000	300°F
MS20615-( )M( )	Monel	None	49,000 to 59,000	800°F
MS20615-( )MP( )	Monel	Cd Plated	49,000 to 59,000	400°F
NAS1198-( )-( )	CRES, A-286	Passivated	85,000 to 95,000	1200°F

* Maximum temperature column is for information/guidance only. Some rivets may sustain strength for only a few seconds at these temperatures. Consequently, it is recommended that consideration be given to the time-at-temperature characteristics of each material specified in Table 206-II to avoid severe degrading of rivets at maximum temperature exposure.

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