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INCH-POUND

FF-S-92C
28 October 2014
SUPERSEDING
FF-S-92B
27 August 1974

FEDERAL SPECIFICATION

SCREW, MACHINE, SLOTTED, CROSS-RECESSED OR HEXAGON HEAD

The General Services Administration has authorized the use of this federal specification by all federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers slotted, cross-recessed and hexagon head machine screws.

1.2 Classification.

1.2.1 Type and style. Machine screws may be of the following types and styles (see 6.2).

Type I - Slotted (see figure 1).

Style 1s	- Round head	Style 6s	- Oval head, 82°
Style 2s	- Flat head, 82°	Style 7s	- Truss head
Style 3s	- Flat head, 100°	Style 8s	- Binding head
Style 4s	- Fillister head	Style 9s	- Pan head
Style 5s	- Fillister head, drilled	Style 10s	- Hexagon head

Type II - Hexagon, Plain (see figure 1).

Style 10p - Hexagon

Type III - Cross-Recessed, Recess Designs I and II (see figure 2).

Style 1c	- Round head	Style 6c	- Oval head, 82°
Style 2c	- Flat head, 82°	Style 7c	- Truss head
Style 3c	- Flat head, 100°	Style 8c	- Binding head
Style 4c	- Fillister head	Style 9c	- Pan head

Note: Use of cross-recess design II is not recommended.

1.2.2 Size. Machine screws shall be classified according to size by the nominal diameter of the body.

Comments, suggestions, or questions on this document should be addressed to Defense Supply Center Philadelphia (DSCP), ATTN: DSCP-NASA, 700 Robbins Avenue, Philadelphia, PA 19111-5096 or e-mail to dscpg&ispecomments@dla.mil . Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil .

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2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL STANDARDS

FED-STD-H28	Screw-Thread Standards for Federal Services
QQ-N-281	Nickel-Copper Alloy Bar, Rod, Plate, Sheet, Strip, Wire, Forgings and Structural and Special Shaped Sections
QQ-N-286	Nickel-Copper-Aluminum Alloy, Wrought (UNS N05500)

COMMERCIAL ITEM DESCRIPTIONS

A-A-55623	Screw, Machine, 82 Degree and 100 Degree, Flat Countersunk Head, Slotted, Plastic (Nylon), UNC-2A and UNF-2A
A-A-55624	Screw, Machine, Pan Head, Slotted, Plastic (Nylon), UNC-2A

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-A-8625	Anodic Coatings for Aluminum and Aluminum Alloys
MIL-F-495	Finish, Chemical, Black, for Copper Alloys
MIL-DTL-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-DTL-13924	Coating, Oxide, Black, for Ferrous Metals
MIL-DTL-16232	Phosphate Coating, Heavy, Manganese or Zinc Base

DEPARTMENT OF DEFENSE STANDARDS

MS18116	Bolt, Stud, and Socket Cap Head Screw, Nickel-Copper-Aluminum Alloy

(Copies of these documents are available online at http://quicksearch.dla.mil/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

ASME B18.6.3	Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series)

(Copies of this document are available from www.asme.org American Society of Mechanical Engineers, Three Park Avenue, M/S 10E, New York, NY 10016-5990.)

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AMERICAN SOCIETY FOR QUALITY (ASQ)

ASQ Z1.4	Sampling Procedures and Tables for Inspection by Attributes.

(Copies of this document are available from www.asq.org American Society for Quality Control, 600 North Plankinton Avenue, Milwaukee, WI 53203.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A108	Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A342/A342M	Standard Test Methods for Permeability of Weakly Magnetic Materials
ASTM B16/B16M	Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines
ASTM B21/B21M	Standard Specification for Naval Brass Rod, Bar, and Shapes
ASTM B36/B36M	Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar
ASTM B98/B98M	Standard Specification for Copper-Silicon Alloy Rod, Bar and Shapes
ASTM B99/B99M	Standard Specification for Copper-Silicon Alloy Wire for General Applications
ASTM B105	Standard Specification for Hard-Drawn Copper Alloy Wires for Electric Conductors
ASTM B121/B121M	Standard Specification for Leaded Brass Plate, Sheet, Strip, and Rolled Bar
ASTM B122/B122M	Standard Specification for Copper-Nickel-Tin Alloy, Copper-Nickel-Zinc Alloy (Nickel Silver), and Copper-Nickel Alloy Plate, Sheet, Strip, and Rolled Bar
ASTM B124/B124M	Standard Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes
ASTM B134/B134M	Standard Specification for Brass Wire
ASTM B138/B138M	Standard Specification for Manganese Bronze Rod, Bar, and Shapes
ASTM B139/B139M	Standard Specification for Phosphor Bronze Rod, Bar, and Shapes
ASTM B150/B150M	Standard Specification for Aluminum Bronze Rod, Bar, and Shapes
ASTM B151/B151M	Standard Specification for Copper-Nickel-Zinc Alloy (Nickel Silver) and Copper-Nickel Rod and Bar
ASTM B159/B159M	Standard Specification for Phosphor Bronze Wire
ASTM B169/B169M	Standard Specification for Aluminum Bronze Sheet, Strip, and Rolled Bar
ASTM B206/B206M	Standard Specification for Copper-Nickel-Zinc (Nickel Silver) Wire and Copper-Nickel Alloy Wire
ASTM B283/B283M	Standard Specification for Copper and Copper-Alloy Die Forgings (Hot-Pressed)
ASTM B633	Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM D4066	Standard Classification System for Nylon Injection and Extrusion Materials (PA)
ASTM E1282	Standard Guide for specifying the Chemical Compositions and Selecting Sampling Practices and Quantitative Analysis Methods for Metals, Ores, and Related Materials
ASTM F1941	Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))

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(Copies of these documents are available from www.astm.org or the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

NATIONAL AEROSPACE STANDARD (NAS)

NASM1312-6	Fastener Test Methods, Method 6, Hardness
NASM1312-8	Fastener Test Methods, Method 6, Tensile Strength

(Copies of this document are available from www.aia-aerospace.org or the Aerospace Industries Association, 1250 Eye Street, N. W., Suite 1200, Washington DC, 20005-3924.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE AIR4127	Steel: Chemical Composition and Hardenability
SAE AMS2700	Passivation of Corrosion Resistant Steels
SAE AMS-C-81562	Coatings, Cadmium, Tin-Cadmium and Zinc (Mechanically Deposited)
SAE AMS-QQ-A-200/3	Aluminum Alloy 2024, Bar, Rod, Shapes, Tube, and Wire, Extruded - UNS A92024
SAE AMS-QQ-A-225/6	Aluminum Alloy 2024, Bar, Rod, and Wire; Rolled, Drawn or Cold Finished - UNS A92024
SAE AMS-QQ-P-416	Plating, Cadmium (Electrodeposited)
SAE AMS-QQ-S-763	Steel, Corrosion Resistant, Bars, Wire, Shapes, and Forgings

(Copies of these documents are available from www.sae.org or the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Materials. Unless otherwise specified (see 6.2), screws shall be made of the materials specified in 3.1.1 through 3.1.9.

3.1.1 Carbon Steel. Carbon steel shall be in accordance with ASTM A108 or SAE AIR4127. Capped or rimmed steels shall be permitted. The minimum ultimate tensile strength shall be 60,000 PSI.

3.1.2 Corrosion-resisting steel. Corrosion-resisting steel shall be the 300 series in accordance with SAE AMS-QQ-S-763 and SAE AIR4127 or equal to or interchangeable with 16-18 or 18-8 chromium nickel alloy steel (developed for cold heading). The minimum ultimate tensile strength shall be 80,000 PSI. Straight chromium alloys of the 400 series shall not be used.

3.1.2.1 Magnetic permeability. Corrosion-resisting steel screws shall have a magnetic permeability of 2.0 maximum (air = 1.0) for a field strength of H = 200 oersteds using a magnetic indicator per ASTM A342/A342M.

3.1.3 Brass. Brass shall be in accordance with ASTM B16/B16M, ASTM B36/B36M, ASTM B121/B121M, ASTM B124/124M, ASTM B134/B134M, ASTM B159/B159M or ASTM B206/B206M. The minimum ultimate tensile strength shall be 55,000 PSI.

3.1.4 Aluminum alloy. Aluminum alloy, 2024, shall be in accordance with SAE AMS-QQ-A-200/3 or SAE AMS-QQ-A-225/6. The minimum ultimate tensile strength shall be 62,000 PSI.

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3.1.5 Copper alloys. Copper alloys shall be in accordance with ASTM B21/B21M, ASTM B98/B98M, ASTM B99/B99M, ASTM B105, ASTM B122/B122M, ASTM B124/B124M, ASTM B138/B138M, ASTM B139/B139M, ASTM B151/B151M, ASTM B206/B206M or ASTM B283/B283M. The mechanical properties shall be as specified in Table I.

3.1.6 Nickel-copper alloy. Nickel-copper alloy shall be in accordance with QQ-N-281, Class A. The mechanical properties shall be as specified in Table I.

3.1.7 Nickel-copper-aluminum alloy. Nickel-copper-aluminum alloy shall be in accordance with QQ-N-286, Class A. The mechanical properties shall be as specified in Table I.

3.1.8 Nickel-aluminum-bronze. Nickel-aluminum-bronze shall be in accordance with ASTM B124/B124M, ASTM B150/B150M, ASTM B169/B169M or ASTM B283/B283M. The mechanical properties shall be as specified in Table I.

3.1.9 Plastic (nylon). Plastic (nylon) shall be in accordance with ASTM D4066, composition A, type I. Plastic machine screws shall be as specified on A-A-55623 and A-A-55624.

3.1.10 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

TABLE I. Mechanical properties of nonferrous machine screws.

Material	Applicable Document	Composition or class	Condition	Ultimate Tensile Strength PSI Min	Yield Strength PSI Min	Elongation 1/ (min) Percent
Copper-nickel-zinc	ASTM B122/B122M ASTM B151/B151M ASTM B206/B206M	Optional	Quarter - hard	58,000	----	Meets bend test
Manganese bronze	ASTM B138/B138M	UNS C67500	Soft	55,000	22,000 3/	20
Nickel-aluminum-bronze	ASTM B124/B124M ASTM B150/B150M ASTM B283/B283M	UNS C63200	Extruded and annealed	90,000	50,000 3/	18
Phosphor bronze	ASTM B139/B139M	UNS C51000	Hard	60,000	35,000 2/	15
Silicon bronze	ASTM B98/B98M ASTM B99/B99M ASTM B105 ASTM B124/B124M	UNS C65100	Hard	60,000	40,000 3/	10
Naval brass	ASTM B21/B21 ASTM B124/B124M ASTM B283/B283M	UNS C46200 UNS C46400	----	60,000	27,000 3/	22
Nickel-copper alloy	QQ-N-281	Class A	----	80,000	40,000 2/	20
Nickel-copper-aluminum alloy	QQ-N-286 MS18116	UNS N05500	Annealed and age hardened	130,000	90,000 2/	20

1/ In 2-inch gage length.
2/ 0.2 percent offset.
3/ 0.5 percent extension under load.

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3.2 Protective finish. Unless otherwise specified (see 6.2), screws shall be furnished uncoated with a naturally bright finish, not heat treated. When finishes are specified, they shall be in accordance with the following paragraphs.

3.2.1 Carbon steel screws.

3.2.1.1 Cadmium plating. Cadmium plating shall be in accordance with SAE AMS-QQ-P-416, Type II, Class 3 or SAE AMS-C-81562, Type II, Class 3C.

3.2.1.2 Zinc coating. Zinc coating shall be in accordance with ASTM B633, Type II, Class Fe/Zn 5 or SAE AMS-C-81562, Type II, Class 3Z.

3.2.1.3 Phosphate coating. Phosphate coating shall be in accordance with MIL-DTL-16232, Type Z, Class 2.

3.2.1.4 Zinc Nickel plating. As an alternative to Cadmium plating, carbon steel screws may be ZnNi plated in accordance with ASTM F1941 Fe/Zn-Ni 8ET alkaline zinc nickel electroplate, 12%-16% mass percent nickel, with chemical conversion coating per MIL-DTL-5541 TYPE II CLASS 1A.

3.2.1.5 Embrittlement relief. Electrodeposited carbon steel screws having a Rockwell Hardness of C40 or higher shall be subjected to an embrittlement relief treatment conducted in accordance with the applicable plating or coating specification.

3.2.2 Corrosion-resisting steel screws.

3.2.2.1 Passivation. Passivation treatment shall be in accordance with SAE AMS2700.

3.2.2.2 Black oxide. Black oxide coating shall be in accordance with MIL-DTL-13924, Class 4.

3.2.3 Brass screws.

3.2.3.1 Black chemical. Black chemical finish shall be in accordance with MIL-F-495.

3.2.4 Aluminum alloy screws.

3.2.4.1 Anodizing. Anodizing shall be in accordance with MIL-A-8625, Type I or II, Class 1.

3.3 Dimensions. Dimensions, and tolerances shall be in accordance with the applicable Military Standard (MS) and ASME B18.6.3.

3.4 Threads. Threads shall be Class 2A, UNC or UNF series, as specified (see 6.2), in accordance with FED-STD-H28. The method of forming shall be at the manufacturer's option.

3.5 Workmanship. Screws shall be free from fins, burrs, sharp edges, cracks and surface contamination.

4. QUALITY ASSURANCE PROVISIONS

4.1 Conformance inspection. Conformance inspection shall include the following.

4.2 Lot. A lot shall consist of all screws of the same material, type, style, size, thread and protective finish, produced under the same conditions and offered for acceptance at one time.

4.3 Sampling.

4.3.1 Sampling for examination. A random sample of screws shall be selected from each lot in accordance with ASQ Z1.4, Inspection Level I.

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4.3.2 Sampling for tests. A random sample of screws shall be selected from each lot in accordance with ASQ Z1.4, Inspection Level S-1.

4.4 Examination. Each screw taken as specified in 4.3.1 shall be examined to verify conformance with this specification. Examination shall be conducted in accordance with Table II. Any screw in the sample containing one or more defects shall be rejected, and if the number of defective screws in any category exceeds the acceptance number for that category, the lot represented by the sample shall be rejected.

TABLE II. Classification of Defects.

Categories	Defects	Inspection Method
Critical	None defined	
Major		
101	Size (1.2.2)	SIE*
102	Length (3.3)	SIE
103	Thread (3.4)	SIE
104	Slot or recess dimensions (3.3)	SIE
105	Bearing surface of flat head surface (3.3)	SIE
Minor		
201	Magnetic permeability (3.1.2.1)	SIE
202	Other dimensions (3.3)	SIE
203	Protective finish missing or incomplete (3.2)	Visual
204	Workmanship (3.5)	Visual

*SIE = Standard Inspection Equipment

4.5 Tests.

4.5.1 Tensile strength. Each screw taken as specified in 4.3.2 shall be tensile strength tested in accordance with NASM1312-8 to verify conformance with 3.1.

4.5.1.1 Screws too short to be tensile strength tested shall be hardness tested in accordance with NASM1312-6. Screws shall meet the minimum hardness requirement of the material from which they were made.

4.5.2 Bending. When ferrous screws are of sufficient length in the unthreaded portion to permit cold bending, each screw taken as specified in 4.3.2 shall withstand being bent 160° without fracture, to a curve having an inner radius equal to the major body diameter of the screw.

4.5.2.1 When the bending test cannot be applied, each test sample shall withstand flattening cold to a thickness equal to one-half of its body diameter, without cracking.

4.6 Protective finish. Examination and test of protective finishes shall be in accordance with the applicable specification of 3.2.

4.7 Chemical analysis. The supplier shall furnish a mill certificate specifying the chemical composition of the material used in the manufacture of the screws. When specified (see 6.2), chemical analysis shall be in accordance with ASTM E1282.

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5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Machine screws are intended to be used in the assembling of parts in relation to each other, either permanently or temporarily.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number and date of this specification.
b. Type, style and size (see 1.2).
c. Material (see 3.1).
d. Protective finish, when required (see 3.2).
e. Thread series (see 3.4).
f. Chemical analysis, when required (see 4.8).
g. Packaging requirements (see 5.1).
h. Applicable MS part number.

6.3 Subject term (key word) listing.

Black oxide
Cadmium plating
Passivation

6.4 Preferred screws. It is recommended that pan head screws be used in lieu of round, truss or binding head screws and that cross-recessed drive (design I) be used in lieu of slotted drive.

6.5 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

6.6 Types and styles. Machine screw types and styles (see 1.2.1 and figures 1 and 2).

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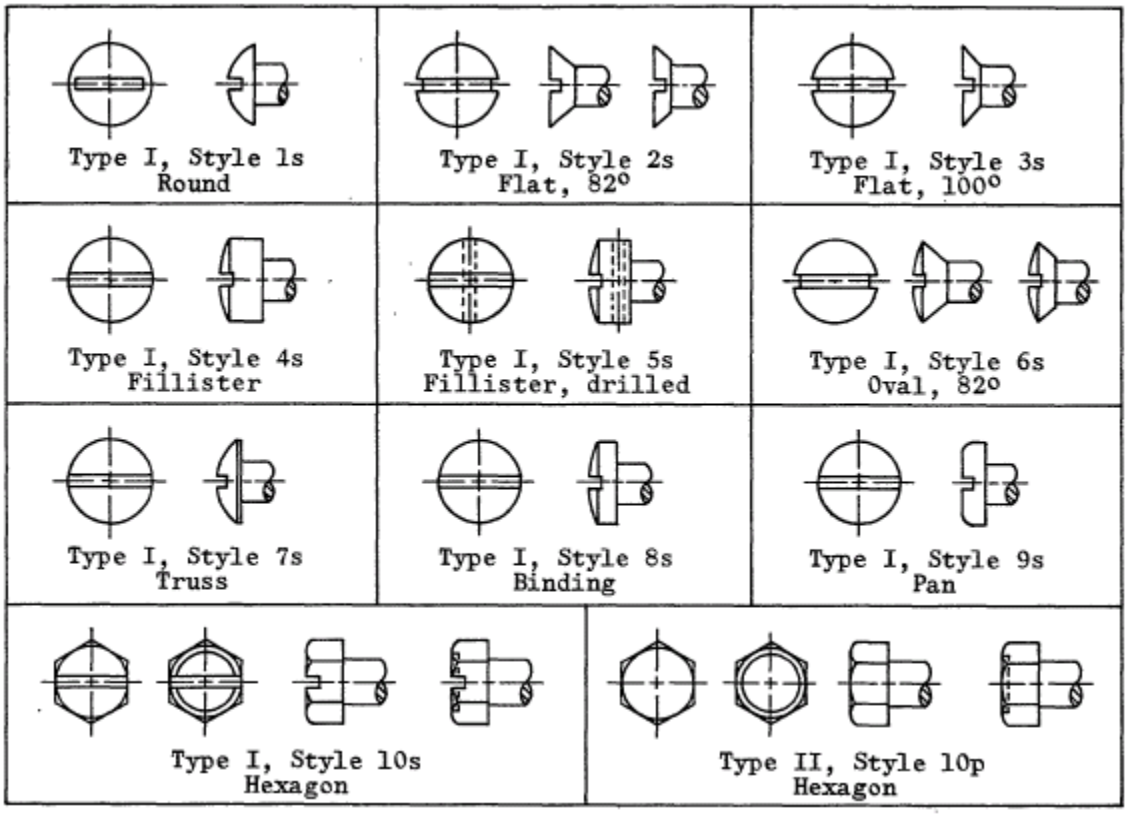

FIGURE 1. Type I – Slotted and Type II – Hexagon, Plain.

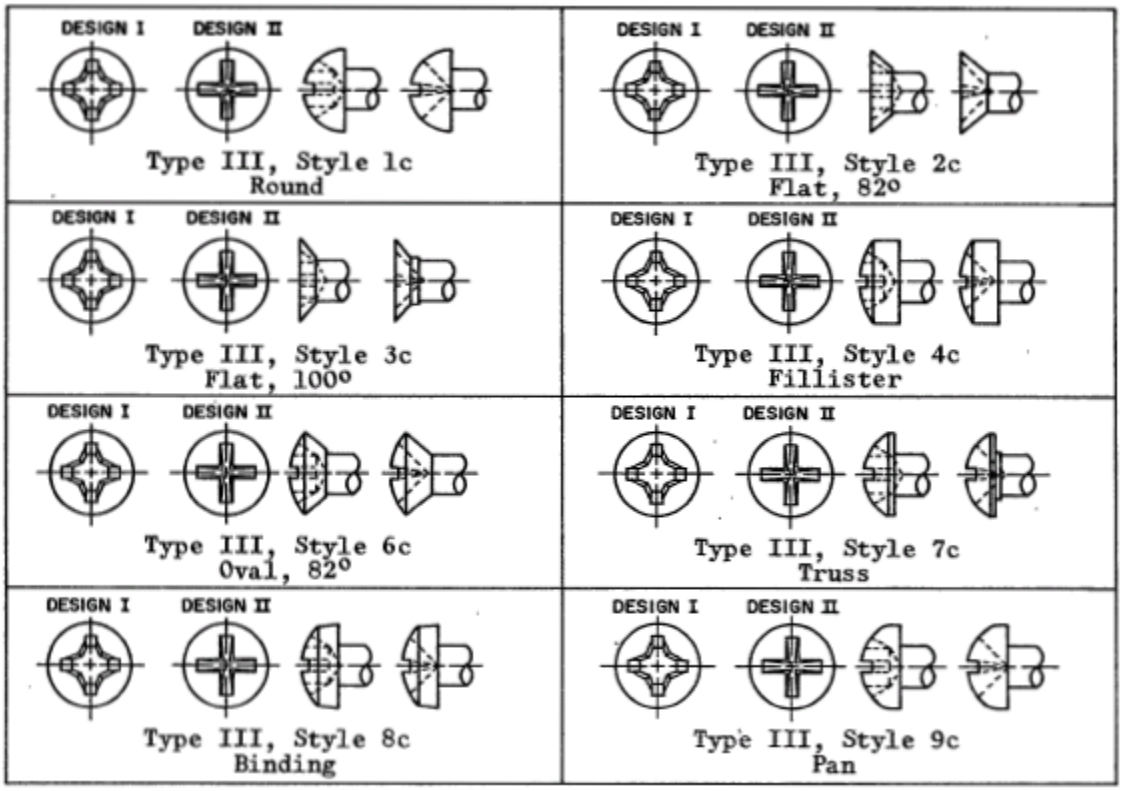

FIGURE 2. Type III – Cross Recessed.

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Review Activity:
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