

Specification for Automotive Resistance Spot Welding Electrodes



American Welding Society



AWS D8.6:2005
An American National Standard

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American National Standards Institute
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Specification for **Automotive Resistance** **Spot Welding Electrodes**

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Prepared by the
American Welding Society (AWS) D8 Committee on Automotive Welding

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This specification outlines the requirements for resistance welding electrodes relating to the automotive welding industry.



American Welding Society

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American Welding Society

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Foreword

This foreword is not a part of AWS D8.6:2005, *Specification for Automotive Resistance Spot Welding Electrodes*, but is included for informational purposes only.

This specification is designed to supplement RWMA Bulletin 16, *Resistance Welding Equipment Standards*.

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS D8 Committee on Automotive Welding, American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

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Specification for Automotive Resistance Spot Welding Electrodes

1. Scope

This specification outlines the requirements for resistance spot welding electrodes, hereafter referred to as AWS RSW electrodes or simply RSW electrodes.

RSW electrodes shall comply with Resistance Welder Manufacturers' Association (RWMA) standards in addition to the specifications and requirements of this specification. In case of any conflict between RWMA standards and AWS standards, the AWS specification shall govern. Examples of several widely used commercially available standard automotive industrial type caps and shanks are shown in the informative annexes.

This specification makes sole use of U.S. Customary Units. Approximate mathematical equivalents in the International System of Units (SI) are provided for comparison in parentheses or in appropriate columns in tables and figures.

Safety and health issues and concerns are beyond the scope of this specification, and therefore are not fully addressed herein. Safety and health information is available from other sources, including, but not limited to, ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*, and applicable federal and state regulations.

2. Normative References

The following standard contains provisions which, through reference in this text, constitute provisions of this AWS standard. For undated references, the latest edition of the referenced standard shall apply. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply.

1. RWMA Bulletin 16, *Resistance Welding Equipment Standards*, Section 1¹; and

¹ RWMA standards are published by the American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

2. AWS A3.0, *Standard Welding Terms and Definitions Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying*.²

3. Terms and Definitions

The definitions given here are the names and descriptions of the various types, shapes, and configurations used to identify resistance spot welding electrodes. All other terms used herein are defined by AWS A3.0, *Standard Welding Terms and Definitions*.

For the purposes of this document, the following terms and definitions apply:

resistance spot welding (RSW) electrodes. The component of a resistance welding machine through which the welding current and, in most cases, pressure are applied directly to the work.

electrode shapes. The various forms of RSW electrodes covered by this standard are as follows:

1. Straight electrodes with tapered shanks
2. Straight electrodes with straight shanks
3. Electrode caps and cap-adaptor shanks
4. Single-bend electrodes
5. Double-bend electrodes
6. Special-faced electrodes

The RSW **electrode tapers** and **straight shanks** are shown and defined in Figure 12 (see Clause 7) of this specification.

nose configurations. The following nose styles are shown and defined in Figure 13 (see 7.2) of this specification.

1. Type A—Pointed

² AWS standards are published by the American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

2. Type B—Dome
3. Type C—Flat
4. Type D—Offset
5. Type E—Truncated cone
6. Type F—Radius

4. Materials

4.1 Wrought and Forged Materials. Only wrought and forged copper alloys are considered standard under this specification, excluding the special face materials.

4.2 Material Structure. The material shall be of uniform homogenous structure, free from irregularities in surface hardness, segregation, oxides, or harmful inclusions.

4.3 Chemical Composition. The approximate chemical compositions of the electrode material shall be as shown in Table 1.

4.4 Physical Requirements. The physical requirements for various electrode materials are given in Table 2.

5. Dimensions and Specifications

5.1 Contact Surfaces. All contact surfaces shall be smooth, 35 μin (0.88 μm) maximum, and free of tool marks for good electrical contact.

5.2 Water Passages. When pointed drills are used for water passages, the drill point shall have a 120° included angle.

5.3 Bent Electrodes. All bent electrodes shall have a minimum bend radius of 3/8 in on 1/2 in (9.5 mm on 12.7 mm) diameter electrodes, 1/2 in on 5/8 in (12.7 mm on 15.9 mm) diameter electrodes, and 5/8 in on 3/4 in (15.9 mm on 19 mm) diameter electrodes.

6. Identification

6.1 Markings. All electrodes shall be clearly marked with the vendor's name and the RSW standard number.

Note: Do not mark on the mechanical or electrical contact surfaces. Etching is not acceptable.

6.2 Electrode Identification Systems for AWS RSW Straight and Bent Electrodes. The following identification system shall be used for the AWS RSW straight and bent electrodes:

6.2.1 Codes for RWMA standard straight electrodes are shown in Table 3 and Figure 1.

6.2.2 Codes for RWMA single-bend electrodes are shown in Table 4 and Figure 2.

6.2.3 Codes for RWMA double-bend electrodes are shown in Table 5 and Figure 3.

6.3 Electrode Identification System for AWS RSW Cap Electrodes. The following identification system will be used for AWS RSW cap electrodes:

6.3.1 Codes for RWMA standard male cap electrodes are shown in Table 6 and Figure 4.

6.3.2 Codes for RWMA standard female cap electrodes are shown in Table 7 and Figure 5.

6.4 Electrode Identification System for AWS RSW Cap-Adaptor Shanks. The following identification system will be used for standard RSW cap-adaptor shanks:

6.4.1 Codes for RWMA straight cap-adaptor shanks for male caps are shown in Table 8 and Figure 6.

6.4.2 Codes for RWMA single-bend cap-adaptor shanks for male caps are shown in Table 9 and Figure 7.

6.4.3 Codes for RWMA double-bend cap-adaptor shanks for male caps are shown in Table 10 and Figure 8.

6.4.4 Codes for RWMA straight cap-adaptor shanks for female caps are shown in Table 11 and Figure 9.

6.4.5 Codes for RWMA single-bend cap-adaptor shanks for female caps are shown in Table 12 and Figure 10.

6.4.6 Codes for RWMA double-bend cap-adaptor shanks for female caps are shown in Table 13 and Figure 11.

7. RWMA Tapered and Straight Shank Electrodes

The term “straight shank” should not be confused with “cap-adaptor shank.” Most standard electrodes are designed with “tapers” to fit standard holders. “Straight shank” electrodes are rare, and refer to those made without tapers. No tables or figures are provided for these items. Dimensions “J” and “K” will match dimension “M” for any “straight shank electrode.”

7.1 Standard Tapered Electrodes. The general dimensions for RSW tapered electrodes shall be as shown in Table 14 and Figure 12.

7.2 Standard Straight Electrode Noses. The nose configurations for RWMA RSW Electrodes shall be as shown in Table 15 and Figure 13.

Table 1
Chemical Compositions^a of RWMA Materials

RWMA Class	RWMA Number	Description	Cu (incl. Ag)	Fe	W	Cd	Ni	Co	Cr	Si	Be	Pb	Zr	Al
Group A—Copper Base Alloys														
1	1.15000 ^b	Zirconium Copper	99.80 Min.			0.7–1.2							0.10–0.20	
1	1.16200 ^b	Cadmium Copper	Rem.	0.02 Max.										
2	2.18150 ^b	Chromium-Zirconium Copper	Rem.						0.5–1.5				0.05–0.25	
2	2.18200 ^b	Chromium Copper	Rem.	0.10 Max.					0.6–1.2	0.10 Max.		0.05 Max.		
3	3.17500 ^b	Cobalt-Beryllium Copper	Rem.	0.10 Max.				2.4–2.7		0.20 Max.	0.4–0.7			0.20 Max.
3	3.17510 ^b	Nickel-Beryllium Copper	Rem.	0.10 Max.			1.4–2.2	0.30 Max.		0.20 Max.	0.2–0.6			0.20 Max.
3	1.18000 ^b	Nickel-Silicon-Chromium Copper	Rem.	0.15 Max.			1.8–3.0		0.1–0.8	0.4–0.8				
4	4.17200 ^b	Beryllium Copper	Rem.									0.02 Max.		0.20 Max.
Group B—Refractory Metal and Refractory Metal Composites														
10	10.74450	Copper Tungsten	43–47		Rem.									
11	11.74400	Copper Tungsten (ASTM B 702 C1 D)	23–27		Rem.									
12	12.74350	Copper Tungsten (ASTM B 702 C1 E)	18–22		Rem.									
13	13.74300	Tungsten			99.9 Min.									
14	14.42300	Molybdenum (ASTM B 387) Alloy 360 or 361			Mo 99.9 Min.									
Group C—Specialty Materials														
20	20.15760	Dispersion Strengthened Copper	98.77	0.01 Max.								0.01 Max.		0.58–0.62

^a Composition by weight %.

^b Last five digits of RWMA numbers correspond to five digits following a “C” in the Copper Development Association and Unified Numbering Systems.

Source: RWMA Bulletin 16, *Resistance Welding Equipment Standards*, Table 1.8.12, January 1996.

Table 2
Minimum Mechanical and Physical Properties for RWMA Copper Alloys

Group A ^a Copper Base Alloys		Hardness Rockwell			Conductivity %IACS ^b			Yield Strength, ^c ksi (5% Ext. Under Load)			Ultimate Tensile Strength, ksi			Elongation % in 2 in or 4 Diameters		
Size Range		Class			Class			Class			Class			Class		
in	mm	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3

Diameter—Round Rod Stock (Cold Worked)

Up to 1	Up to 25	65 HRB	75 HRB	90 HRB	80%	75%	45%	45	55	90	60	65	95	13%	13%	9%
Over 1 to 2	Over 25 to 51	60 HRB	70 HRB	90 HRB	80%	75%	45%	45	55	90	55	59	92	14%	13%	9%
Over 2 to 3	Over 51 to 76	55 HRB	65 HRB	90 HRB	80%	75%	45%	45	55	90	50	55	88	15%	13%	9%

Thickness—Square, Rectangular, and Hexagonal Bar Stock (Cold Worked)

Up to 1	Up to 25	55 HRB	70 HRB	90 HRB	80%	75%	45%	45	45	90	60	65	95	13%	13%	9%
Over 1	Over 25	50 HRB	65 HRB	90 HRB	80%	75%	45%	45	40	90	50	55	90	14%	13%	9%

Thickness—Forgings

Up to 1	Up to 25	55 HRB	65 HRB	90 HRB ^d	80%	75%	45%	45	45	50	60	55	94	12%	13%	9%
Over 1 to 2	Over 25 to 51	50 HRB	65 HRB	90 HRB ^d	80%	75%	45%	45	45	50	50	55	90	13%	13%	9%
Over 2	Over 51	50 HRB	65 HRB	90 HRB ^d	80%	75%	45%	45	40	50	50	55	88	13%	13%	9%

Castings

All	All	NA	55 HRB	90 HRB	NA	70%	45%	NA	20	45	NA	45	75	NA	12%	5%
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^a All materials are in fully heat treated condition unless otherwise specified. Round rod up to 1 in (25 mm) diameter is fully heat treated and cold worked.

^b Conductivity = $\frac{1}{0.0058 \text{ (Resistivity)}}$ where: Conductivity is expressed in %IACS and resistivity is in the units $\mu\Omega \text{ cm}$.

^c Yield strength listed is typical—actual can be higher or lower.

^d Hot worked and heat treated—but not cold worked.

Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, Table 1.8.4, January 1996.

8. RWMA Electrode Caps and Cap-Adaptor Shanks

8.1 Male Cap Electrodes. The dimensions for RWMA RSW male electrode caps shall be as shown in Table 16 and Figure 14.

8.2 Cap-Adaptor Shanks for Male Cap Electrodes. The dimensions for RWMA RSW cap-adaptor shanks for male cap electrodes shall be as shown in Table 17 and Figure 15.

8.3 Female Cap Electrodes. The dimensions for RWMA RSW female electrode caps shall be as shown in Table 18 and Figure 16.

8.4 Cap-Adaptor Shanks for Female Cap Electrodes. The dimensions for RWMA RSW cap-adaptor shanks for female cap electrodes are shown in Table 19 and Figure 17.

9. Single-Bend Electrodes

9.1 Dimensions for Single-Bend Electrodes. The dimensions for RWMA RSW single-bend electrodes are shown in Figure 2 (see 6.2.2), with tapers conforming to Table 14 and Figure 12 (see 7.1), and noses conforming to Table 15 and Figure 13 (see 7.2).

9.2 Dimensions for Water Tubes in Single-Bend Electrodes. RWMA single-bend electrodes shall be supplied with water tubes preinserted. Dimensions for water tubes are given in Table 20.

10. Double-Bend Electrodes

10.1 Dimensions for Double-Bend Electrodes. The dimensions for RWMA RSW double-bend electrodes are shown in Figure 3 (see 6.2.3), with tapers conforming to Table 14 and Figure 12 (see 7.1), and noses conforming to Table 15 and Figure 13 (see 7.2). Table 21 gives commonly available double-bend electrode designations as listed by the RWMA.

10.2 Dimensions for Water Tubes in Double-Bend Electrodes. RWMA RSW double-bend electrodes shall be supplied with water tubes preinserted. Dimensions for the water tubes are given in Table 20 (see 9.2).

11. Special-Faced Electrodes

The nose portions of standard electrodes may be supplied with special faces of refractory metal compositions. Standard nose forms are shown in Table 15 and Figure

13. RWMA standard face materials are shown in Table 1, Group B.

12. Single- and Double-Bend Adaptor Shanks for Standard Electrode Caps

12.1 Single-Bend Adaptor Shanks for Standard Electrode Caps

12.1.1 The general dimensions for RWMA RSW single-bend adaptor shanks for male electrode caps are shown in Figure 7 (see 6.4.2), with taper details conforming to Table 18 and Figure 15 (see 8.2).

12.1.2 The general dimensions for RWMA RSW single-bend adaptor shanks for female electrode caps are shown in Figure 10 (see 6.4.5), with taper details conforming to Table 19 and Figure 17 (see 8.4).

12.1.3 Single-bend adaptor shanks shall be supplied with water tubes preinserted. Dimensions for the water tubes are given in Table 20 (see 9.2).

12.2 Double-Bend Adaptor Shanks for Standard Electrode Caps

12.2.1 The general dimensions for RWMA RSW double-bend adaptor shanks for male electrode caps are shown in Figure 8 (see 6.4.3), with taper details conforming to Table 17 and Figure 15 (see 8.2).

12.2.2 The general dimension for RWMA RSW double-bend adaptor shanks for female electrode caps are shown in Figure 11 (see 6.4.6), with taper details conforming to Table 18 and Figure 16 (see 8.3).

12.2.3 Double-bend adaptor shanks shall be supplied with water tubes preinserted. Dimensions for the water tubes are given in Table 20 (see 9.2).

13. Engineering Information

Several tables and figures have been placed into the annexes of this specification. This, while very useful, is to be considered informational only, and does not imply any requirements of this standard.

Included are:

Annex A—Recommended Electrode Materials for Spot Welding Dissimilar and Similar Metals

Annex B—Standard Gauges for Confirmation of RWMA “Standard Electrode Tapers”

Annex C—Standard Gauges for Confirmation of RWMA “Standard Male Cap Electrode Tapers”

Annex D—Standard Gauges for Confirmation of RWMA “Standard Female Cap Electrode Tapers”

Annex E—Recommended Sizes of Stock RWMA Electrode Numbers and Welding Face Diameters for use at Various Welding Force Ranges

Annex F—Cap Electrode and Cap Electrode Adaptor Conventions in Common Usage by Automotive Companies

Figure F.1—Male Cap Electrode Ordering Codes

Figure F.1M—Male Cap Electrode Ordering Codes

Figure F.2—Male Cap Electrode Dimensions

Figure F.2M—Male Cap Electrode Dimensions

Figure F.3—Male Cap Electrode Nose Descriptions

Figure F.3M—Male Cap Electrode Nose Descriptions

Figure F.4—Male Cap Electrode Adaptor Shank—Ordering Codes

Figure F.4M—Male Cap Electrode Adaptor Shank—Ordering Codes

Figure F.5—Male Cap Electrode Adaptor Shank—Dimensional Specifications

Figure F.5M—Male Cap Electrode Adaptor Shank—Dimensional Specifications

Figure F.6—3/4 in Increased Water Flow Male Cap Electrodes—Ordering Codes

Figure F.6M—19 mm Increased Water Flow Male Cap Electrodes—Ordering Codes

Figure F.7—3/4 in Increased Water Flow Male Cap Electrodes—Nose Design

Figure F.7M—19 mm Increased Water Flow Male Cap Electrodes—Nose Design

Figure F.8—3/4 in Increased Water Flow Male Cap Electrodes—Dimensions

Figure F.8M—19 mm Increased Water Flow Male Cap Electrodes—Dimensions

Figure F.9—Type “F” Female Cap Electrodes—Ordering Codes

Figure F.10—Type “F” Female Cap Electrodes—Description

Figure F.10M—Type “F” Female Cap Electrodes—Description

Figure F.11—Straight Adaptor for Type “F” Female Cap Electrodes—Ordering Codes

Figure F.12—Straight Adaptor for Type “F” Female Cap Electrodes—Description

Figure F.12M—Straight Adaptor for Type “F” Female Cap Electrodes—Description

Annex G—Female Cap Electrode and Adaptor Conventions in Common Usage by Automotive Companies

Figure G.1—Nomenclature for Straight Adaptors and Assemblies for Female Cap Electrodes with RWMA #5 Taper

Figure G.1M—Nomenclature for Straight Adaptors and Assemblies for Female Cap Electrodes with RWMA #5 Taper

Figure G.2—Nomenclature for Straight Adaptors and Assemblies for Female Cap Electrodes with RWMA #4 Cap and RWMA #4 Tapers

Figure G.2M—Nomenclature for Straight Adaptors and Assemblies for Female Cap Electrodes with RWMA #4 Cap and RWMA #4 Tapers

Figure G.3—Nomenclature for Straight Adaptors and Caps for Female Cap Electrodes with RWMA #6 Taper

Figure G.3M—Nomenclature for Straight Adaptors and Caps for Female Cap Electrodes with RWMA #6 Taper

Figure G.4—Nomenclature for Female Electrode Caps

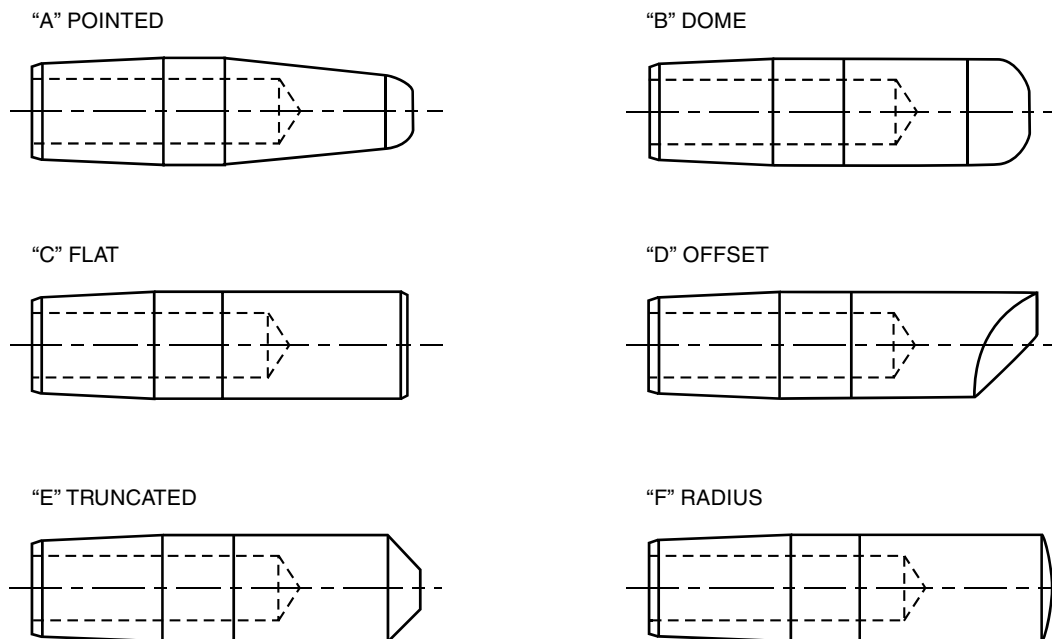
Figure G.4M—Nomenclature for Female Electrode Caps

Annex H—Guidelines for the Preparation of Technical Inquiries

Table 3
Coding for Standard Straight Electrodes

A	2	4	1	2	
					Length in 1/4 in (6.4 mm) increments, i.e., 12 = 3 in (76.2 mm)
					4 = #4 RW Size Electrode, 31/64 in (12.2 mm) or 1/2 in (12.7 mm) Dia.
					5 = #5 RW Size Electrode, 5/8 in (15.9 mm) Dia. (see Clause 7)
					6 = #6 RW Size Electrode, 3/4 in (19.1 mm) Dia.
					7 = #7 RW Size Electrode, 7/8 in (22.2 mm) Dia.
					1 = RWMA Group A, Class 1 Material
					2 = RWMA Group A, Class 2 Material (see 4.3 and 4.4)
					3 = RWMA Group A, Class 3 Material
					20 = RWMA Group C, Class 20 Material
					A = Electrode with "A" (Pointed) Nose
					B = Electrode with "B" (Dome) Nose
					C = Electrode with "C" (Flat) Nose
					D = Electrode with "D" (Offset) Nose
					E = Electrode with "E" (Truncated) Nose
					F = Electrode with "F" (Radius) Nose

(Figure 1)

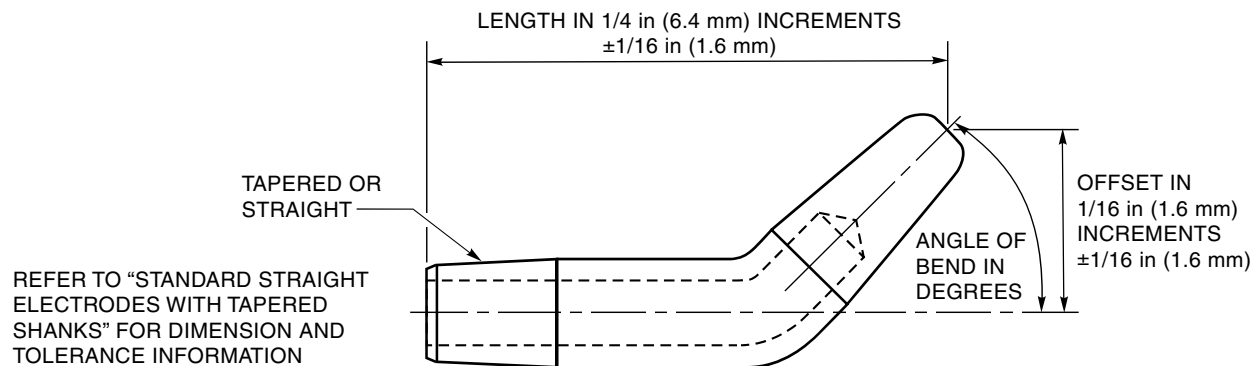


Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.16, p. 1-8-23, January 1996.

Figure 1—Electrode Types

Table 4
Coding for Single-Bend Electrodes

S A - 3 S 6 1 6 - 1 2 - 1 5	
15	= Angle of Bend in Degrees
12	= Amount of Offset in 1/16 in (1.59 mm) increments [i.e., 12 = 12/16 in (19.1 mm) = 3/4 in (19.1 mm) Offset]
1 6	Electrode Length in 1/4 in (6.4 mm) increments [i.e., 12 = 3 in (76.2 mm)]
	T 4 = #4 RW Taper on 31/64 in (12.2 mm) or 1/2 in (12.7 mm) Dia. Stock
	T 5 = #5 RW Taper on 5/8 in (15.9 mm) Dia. Stock
	T 6 = #6 RW Taper on 3/4 in (19.1 mm) Dia. Stock
	T 7 = #7 RW Taper on 7/8 in (22.2 mm) Dia. Stock (see Clause 9)
	S 4 = No Taper on 1/2 in (12.7 mm) Dia. Stock
	S 5 = No Taper on 5/8 in (15.9 mm) Dia. Stock
	S 6 = No Taper on 3/4 in (19.1 mm) Dia. Stock
	S 7 = No Taper on 7/8 in (22.2 mm) Dia. Stock
2	= RWMA Group A, Class 2 Material (see 4.3 and 4.4)
3	= RWMA Group A, Class 3 Material
S A	= Single-Bend "A" (Pointed) Nose Electrode
S B	= Single-Bend "B" (Dome) Nose Electrode
S C	= Single-Bend "C" (Flat) Nose Electrode (Figure 1)
S D	= Single-Bend "D" (Offset) Nose Electrode
S E	= Single-Bend "E" (Truncated) Nose Electrode
S F	= Single-Bend "F" (Radius) Nose Electrode

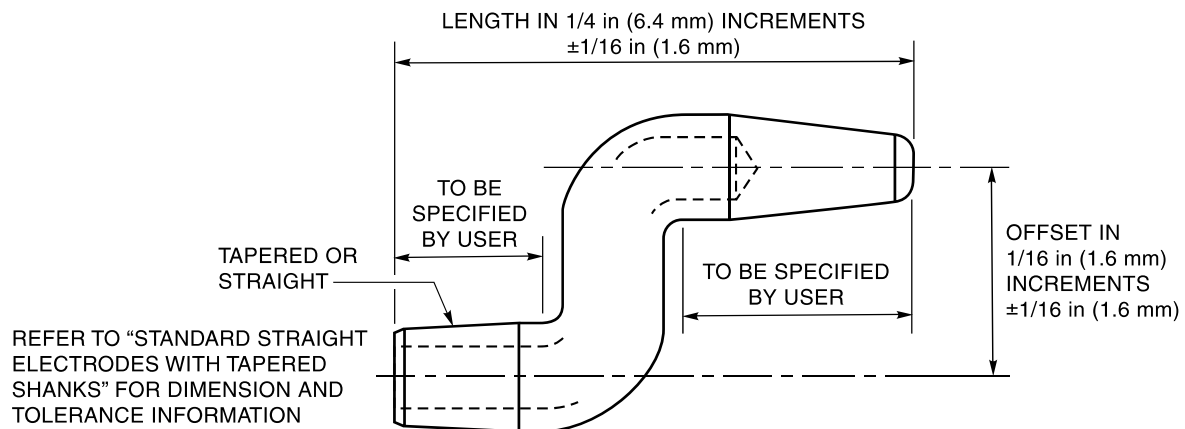


Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.17, p. 1-8-28, January 1996.

Figure 2—Single-Bend Electrode Terminology

Table 5
Coding for Double-Bend Electrodes

D A - 2	T 5	16 - 12	12 = Amount of Offset in 1/16 in (1.59 mm) increments [i.e., 12 = 12/16 in (19.1 mm) = 3/4 in (19.1 mm) Offset]
			Electrode Length in 1/4 in (6.4 mm) increments [i.e., 16 = 4 in (101.6 mm)]
			T 4 = #4 RW Taper on 31/64 in (12.2 mm) or 1/2 in (12.7 mm) Dia. Stock T 5 = #5 RW Taper on 5/8 in (15.9 mm) Dia. Stock T 6 = #6 RW Taper on 3/4 in (19.1 mm) Dia. Stock T 7 = #7 RW Taper on 7/8 in (22.2 mm) Dia. Stock (see Clause 10)
			S 4 = No Taper on 1/2 in (12.7 mm) Dia. Stock S 5 = No Taper on 5/8 in (15.9 mm) Dia. Stock S 6 = No Taper on 3/4 in (19.1 mm) Dia. Stock S 5 = No Taper on 7/8 in (22.2 mm) Dia. Stock
			2 = RWMA Group A, Class 2 Material 3 = RWMA Group A, Class 3 Material (see 4.3 and 4.4)
			D A = Double-Bend "A" (Pointed) Nose Electrode D B = Double-Bend "B" (Dome) Nose Electrode D C = Double-Bend "C" (Flat) Nose Electrode D D = Double-Bend "D" (Offset) Nose Electrode D E = Double-Bend "E" (Truncated) Nose Electrode D F = Double-Bend "F" (Radius) Nose Electrode (Figure 1)

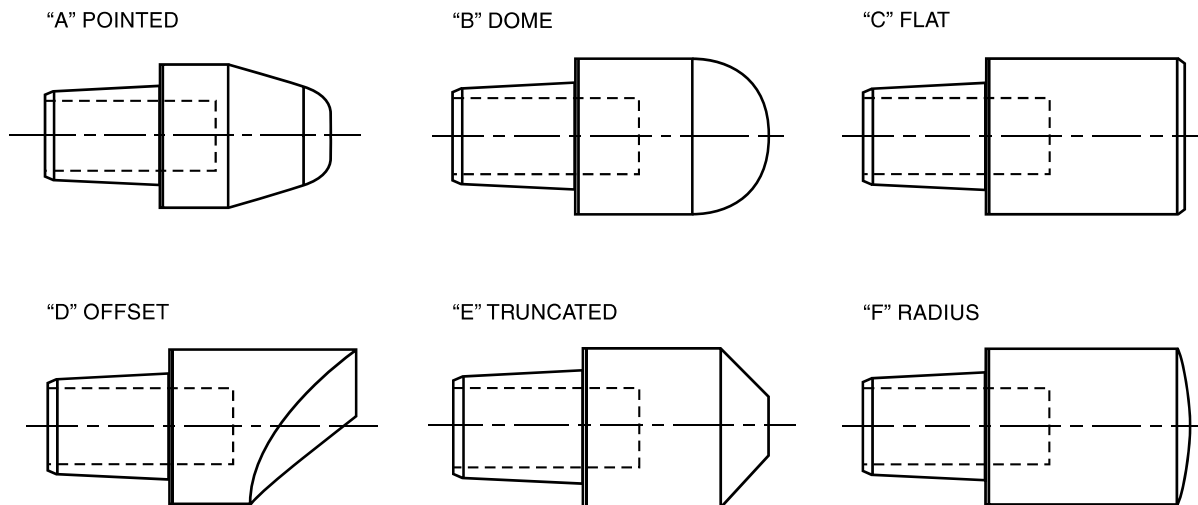


Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.18, p. 1-8-29, January 1996.

Figure 3—Double-Bend Electrode Terminology

Table 6
Coding for Standard Male Cap Electrodes

M A - 2 5	5	4	= #4 RW Size on 31/64 in (12.2 mm) or 1/2 in (12.7 mm) Dia. Stock	
		5	= #5 RW Taper on 5/8 in (15.9 mm) Dia. Stock	
		6	= #6 RW Taper on 3/4 in (19.1 mm) Dia. Stock	
		7	= #7 RW Taper on 7/8 in (22.2 mm) Dia. Stock	(see Clause 8)
	1	1	= RWMA Group A, Class 1 Material	
		2	= RWMA Group A, Class 2 Material	(see 4.3 and 4.4)
		3	= RWMA Group A, Class 3 Material	
		20	= RWMA Group C, Class 20 Material	
	M A = Male Cap Electrode with "A" (Pointed) Nose			
	M B = Male Cap Electrode with "B" (Dome) Nose Electrode			
	M C = Male Cap Electrode with "C" (Flat) Nose Electrode			(Figure 4)
	M D = Male Cap Electrode with "D" (Offset) Nose Electrode			
	M E = Male Cap Electrode with "E" (Truncated) Nose Electrode			
	M F = Male Cap Electrode with "F" (Radius) Nose Electrode			



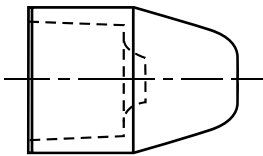
Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.20, p. 1-8-30, January 1996.

Figure 4—Male Cap Electrode Types

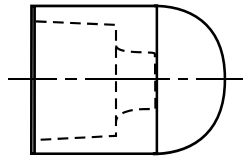
Table 7
Coding for Standard Female Cap Electrodes

F A - 2 5	5	4	= #4 RW Size on 31/64 in (12.2 mm) or 1/2 in (12.7 mm) Dia. Stock	
		5	= #5 RW Taper on 5/8 in (15.9 mm) Dia. Stock	
		6	= #6 RW Taper on 3/4 in (19.1 mm) Dia. Stock	
		7	= #7 RW Taper on 7/8 in (22.2 mm) Dia. Stock	(see Clause 8)
	1	1	= RWMA Group A, Class 1 Material	
		2	= RWMA Group A, Class 2 Material	(see 4.3 and 4.4)
		3	= RWMA Group A, Class 3 Material	
		20	= RWMA Group C, Class 20 Material	
	F A	F A	= Female Cap Electrode with "A" (Pointed) Nose	
		F B	= Female Cap Electrode with "B" (Dome) Nose Electrode	
		F C	= Female Cap Electrode with "C" (Flat) Nose Electrode	(Figure 5)
		F D	= Female Cap Electrode with "D" (Offset) Nose Electrode	
		F E	= Female Cap Electrode with "E" (Truncated) Nose Electrode	
		F F	= Female Cap Electrode with "F" (Radius) Nose Electrode	

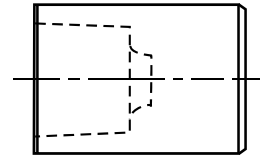
"A" POINTED



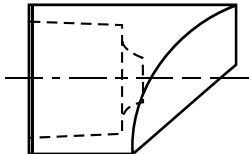
"B" DOME



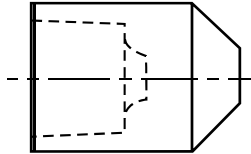
"C" FLAT



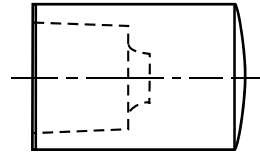
"D" OFFSET



"E" TRUNCATED



"F" RADIUS



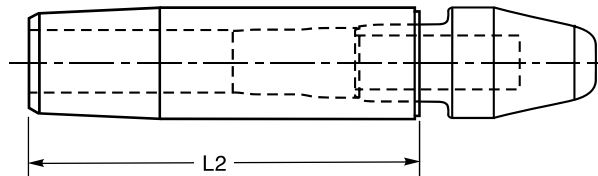
Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.24, p. 1-8-36, January 1996.

Figure 5—Female Cap Electrode Types

Table 8
Coding for Straight Cap-Adaptor Shanks for Male Electrode Caps

S M - 2 T 5 1 2	Electrode Length in 1/4 in (6.4 mm) increments [i.e., 12 = 3 in (76.2 mm)]	(Figure 6-L2)
	T 4 = #4 RW Taper on 31/64 in (12.2 mm) or 1/2 in (12.7 mm) Dia. Stock	
	T 5 = #5 RW Taper on 5/8 in (15.9 mm) Dia. Stock	
	T 6 = #6 RW Taper on 3/4 in (19.1 mm) Dia. Stock	
	T 7 = #7 RW Taper on 7/8 in (22.2 mm) Dia. Stock	(see Clause 8)
	S 4 = No Taper on 1/2 in (12.7 mm) Dia. Stock	
	S 5 = No Taper on 5/8 in (15.9 mm) Dia. Stock	
	S 6 = No Taper on 3/4 in (19.1 mm) Dia. Stock	
	S 7 = No Taper on 7/8 in (22.2 mm) Dia. Stock	
	2 = RWMA Group A, Class 2 Material	(see 4.3 and 4.4)
	3 = RWMA Group A, Class 3 Material	
	S M = Straight adaptor shank for Male cap electrodes	(Figure 6)

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SHANKS" FOR DIMENSION AND
TOLERANCE INFORMATION

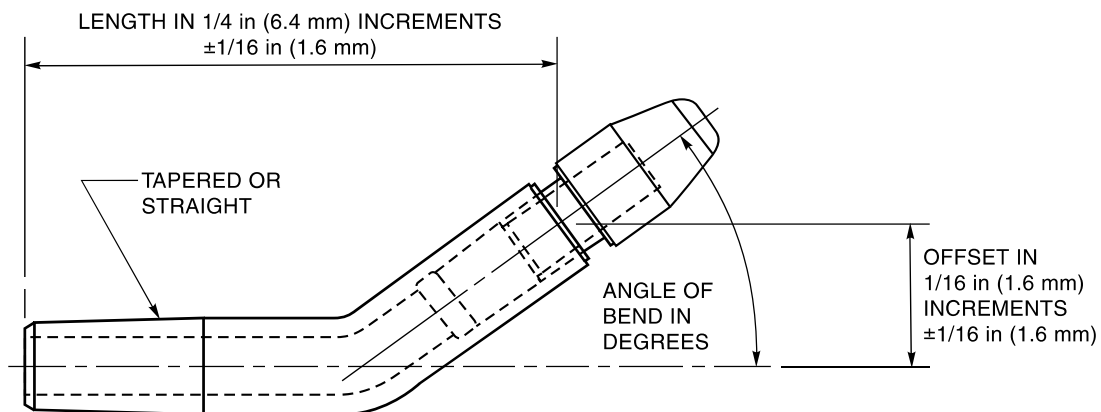


Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.21, p. 1-8-34, January 1996.

Figure 6—Straight Cap-Adaptor Shank for Male Cap

Table 9
Coding for Single-Bend Adaptor Shanks for Male Electrode Caps

S M S - 3	S 6	1 6 - 1 2 - 1 5	15 = Angle of Bend in Degrees	
			12 = Amount of Offset in 1/16 in (1.59 mm) increments [i.e., 12 = 12/16 in (19.1 mm) = 3/4 in (19.1 mm) Offset]	
			Shank Length in 1/4 in (6.4 mm) increments [i.e., 16 = 4 in (101.6 mm)]	(Figure 7)
			T 4 = #4 RW Taper on 31/64 in (12.2 mm) or 1/2 in (12.7 mm) Dia. Stock T 5 = #5 RW Taper on 5/8 in (15.9 mm) Dia. Stock T 6 = #6 RW Taper on 3/4 in (19.1 mm) Dia. Stock T 7 = #7 RW Taper on 7/8 in (22.2 mm) Dia. Stock	(see Clause 8)
			S 4 = No Taper on 1/2 in (12.7 mm) Dia. Stock S 5 = No Taper on 5/8 in (15.9 mm) Dia. Stock S 6 = No Taper on 3/4 in (19.1 mm) Dia. Stock S 5 = No Taper on 7/8 in (22.2 mm) Dia. Stock	
			2 = RWMA Group A, Class 2 Material 3 = RWMA Group A, Class 3 Material	(see 4.3 and 4.4)
			S M S = Adaptor shank for Male cap electrodes with Single-Bend	(Figure 7)



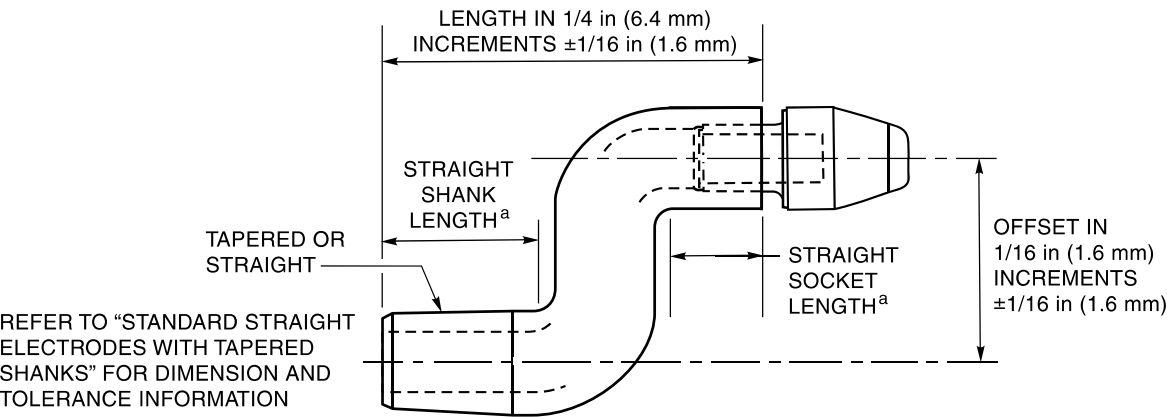
REFER TO "STANDARD STRAIGHT ELECTRODES
 WITH TAPERED SHANKS" FOR DIMENSION
 AND TOLERANCE INFORMATION

Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.22, p. 1-8-36, January 1996.

Figure 7—Single-Bend Cap-Adaptor Shank for Male Cap

Table 10
Coding for Double-Bend Adaptor Shanks for Male Electrode Caps

S M D - 2	T 5	1 6 - 1 2	12 = Amount of Offset in 1/16 in (1.59 mm) increments [i.e., 12 = 12/16 in (19.1 mm) = 3/4 in (19.1 mm) Offset]	
			Electrode Length in 1/4 in (6.4 mm) increments [i.e., 16 = 4 in (101.6 mm)]	(Figure 8)
			T 4 = #4 RW Taper on 31/64 in (12.2 mm) or 1/2 in (12.7 mm) Dia. Stock T 5 = #5 RW Taper on 5/8 in (15.9 mm) Dia. Stock T 6 = #6 RW Taper on 3/4 in (19.1 mm) Dia. Stock T 7 = #7 RW Taper on 7/8 in (22.2 mm) Dia. Stock	(see Clause 8)
			S 4 = No Taper on 1/2 in (12.7 mm) Dia. Stock S 5 = No Taper on 5/8 in (15.9 mm) Dia. Stock S 6 = No Taper on 3/4 in (19.1 mm) Dia. Stock S 5 = No Taper on 7/8 in (22.2 mm) Dia. Stock	
			2 = RWMA Group A, Class 2 Material 3 = RWMA Group A, Class 3 Material	(see 4.3 and 4.4)
			S M D = Adaptor shank for Male cap electrodes with Double-Bend	(Figure 8)



^aEither Straight Shank Length or Straight Socket Length may be specified by user, but not both.

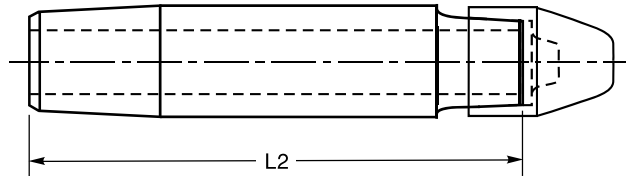
Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.23, p. 1-8-37, January 1996.

Figure 8—Double-Bend Cap-Adaptor Shank for Male Cap

Table 11
Coding for Straight Cap-Adaptor Shanks for Female Electrode Caps

S F - 2 T 5 1 2	Electrode Length in 1/4 in (6.4 mm) increments [i.e., 12 = 3 in (76.2 mm)]	(Figure 9-L2)
	T 4 = #4 RW Taper on 31/64 in (12.2 mm) or 1/2 in (12.7 mm) Dia. Stock	
	T 5 = #5 RW Taper on 5/8 in (15.9 mm) Dia. Stock	
	T 6 = #6 RW Taper on 3/4 in (19.1 mm) Dia. Stock	
	T 7 = #7 RW Taper on 7/8 in (22.2 mm) Dia. Stock	(see Clause 8)
	S 4 = No Taper on 1/2 in (12.7 mm) Dia. Stock	
	S 5 = No Taper on 5/8 in (15.9 mm) Dia. Stock	
	S 6 = No Taper on 3/4 in (19.1 mm) Dia. Stock	
	S 7 = No Taper on 7/8 in (22.2 mm) Dia. Stock	
	2 = RWMA Group A, Class 2 Material	(see 4.3 and 4.4)
	3 = RWMA Group A, Class 3 Material	
	S F = Straight adaptor shank for Female cap electrode	(Figure 9)

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TOLERANCE INFORMATION

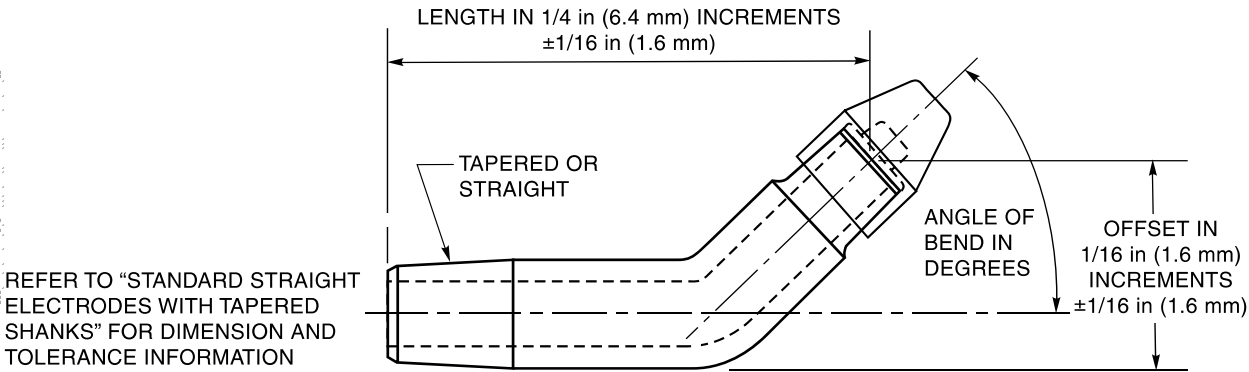


Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.25, p. 1-8-40, January 1996.

Figure 9—Straight Cap-Adaptor Shank for Female Cap

Table 12
Coding for Single-Bend Adaptor Shanks for Female Electrode Caps

S F S - 3 S 6 1 6 - 1 2 - 1 5		
	15 = Angle of Bend in Degrees	
	12 = Amount of Offset in 1/16 in (1.59 mm) increments [i.e., 12 = 12/16 in (19.1 mm) = 3/4 in (19.1 mm) Offset]	
	Shank Length in 1/4 in (6.4 mm) increments [i.e., 16 = 4 in (101.6 mm)]	(Figure 10)
	T 4 = #4 RW Taper on 31/64 in (12.2 mm) or 1/2 in (12.7 mm) Dia. Stock T 5 = #5 RW Taper on 5/8 in (15.9 mm) Dia. Stock T 6 = #6 RW Taper on 3/4 in (19.1 mm) Dia. Stock T 7 = #7 RW Taper on 7/8 in (22.2 mm) Dia. Stock	(see Clause 8)
	S 4 = No Taper on 1/2 in (12.7 mm) Dia. Stock S 5 = No Taper on 5/8 in (15.9 mm) Dia. Stock S 6 = No Taper on 3/4 in (19.1 mm) Dia. Stock S 5 = No Taper on 7/8 in (22.2 mm) Dia. Stock	
	2 = RWMA Group A, Class 2 Material 3 = RWMA Group A, Class 3 Material	(see 4.3 and 4.4)
	S F S = Adaptor shank for Female cap electrodes with Single-Bend	(Figure 10)

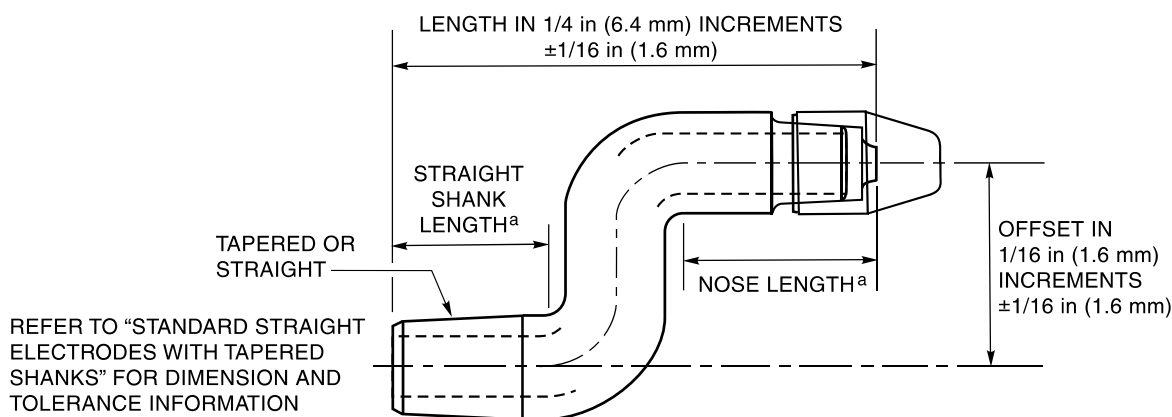


Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.26, p. 1-8-42, January 1996.

Figure 10—Single-Bend Cap-Adaptor Shank for Female Cap

Table 13
Coding for Double-Bend Adaptor Shanks for Female Electrode Caps

S F D - 2 T 5 16 - 12		
	12 = Amount of Offset in 1/16 in (1.59 mm) increments [i.e., 12 = 12/16 in (19.1 mm) = 3/4 in (19.1 mm) Offset]	(Figure 11)
	Electrode Length in 1/4 in (6.4 mm) increments [i.e., 16 = 4 in (101.6 mm)]	(Figure 11)
	T 4 = #4 RW Taper on 31/64 in (12.2 mm) or 1/2 in (12.7 mm) Dia. Stock T 5 = #5 RW Taper on 5/8 in (15.9 mm) Dia. Stock T 6 = #6 RW Taper on 3/4 in (19.1 mm) Dia. Stock T 7 = #7 RW Taper on 7/8 in (22.2 mm) Dia. Stock	(see Clause 8)
	S 4 = No Taper on 1/2 in (12.7 mm) Dia. Stock S 5 = No Taper on 5/8 in (15.9 mm) Dia. Stock S 6 = No Taper on 3/4 in (19.1 mm) Dia. Stock S 5 = No Taper on 7/8 in (22.2 mm) Dia. Stock	
	2 = RWMA Group A, Class 2 Material 3 = RWMA Group A, Class 3 Material	(see 4.3 and 4.4)
	S F D = Adaptor shank for Female cap electrodes with Double-Bend	(Figure 11)



^aEither Straight Shank Length or Nose Length may be specified by user, but not both.

Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.27, p. 1-8-43, January 1996.

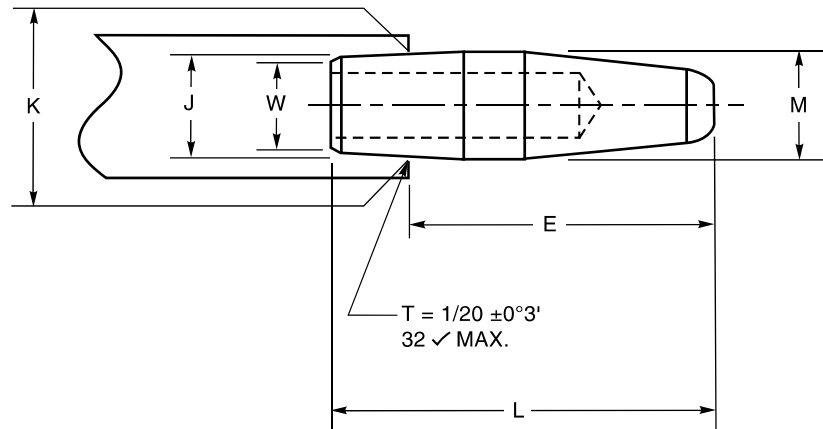
Figure 11—Double-Bend Cap-Adaptor Shank for Female Cap

Table 14
Standard Dimensions for Straight Electrodes, Tapers, and Water Holes

Electrode Number (RWMA Class 2) Material Assumed		L Overall Length in (mm) Tol. ± 0.010 in (± 0.25 mm)	E Extension from Std. Holder (Ref.) in (mm)	M Major Dia. in (mm)	T RWMA Taper Size	W Water Hole Dia. in (mm) Tol. ± 0.010 in (± 0.25 mm)	J Minor Taper Dia. (Ref.) in (mm)	K ^a Taper Dia. @ 1/2 in (12.7 mm) Tol. ± 0.010 in (0.25 mm)
A, B, C, D, E, or F	02405	1.25 (31.8)	0.75 (19.1)					
	02406	1.50 (38.1)	1.00 (25.4)					
	02407	1.75 (44.5)	1.25 (31.8)					
	02408	2.00 (50.8)	1.50 (38.1)					
	02409	2.25 (57.2)	1.75 (44.5)	0.482				
	02420	2.50 (63.5)	2.00 (50.8)	or	4	0.28	0.438	0.463
	02411	2.75 (69.9)	2.25 (57.2)	0.500		(7.1)	(11.1)	(11.8)
	02412	3.00 (76.2)	2.50 (63.5)	(12.7)				
	02413	3.25 (82.6)	2.75 (69.9)					
	02414	3.50 (88.9)	3.00 (76.2)					
	02415	3.75 (95.3)	3.25 (82.6)					
	02416	4.00 (101.6)	3.50 (88.9)					
A, B, C, D, E, or F	02505	1.25 (31.8)	0.50 (12.7)					
	02506	1.50 (38.1)	0.75 (19.1)					
	02507	1.75 (44.5)	1.00 (25.4)					
	02508	2.00 (50.8)	1.25 (31.8)					
	02509	2.25 (57.2)	1.50 (38.1)					
	02510	2.50 (63.5)	1.75 (44.5)	0.625	5	0.38	0.588	0.613
	02511	2.75 (69.9)	2.00 (50.8)	(15.8)		(9.5)	(14.9)	(15.6)
	02512	3.00 (76.2)	2.25 (57.2)					
	02513	3.25 (82.6)	2.50 (63.5)					
	02514	3.50 (88.9)	2.75 (69.9)					
	02515	3.75 (95.3)	3.00 (76.2)					
	02516	4.00 (101.6)	3.25 (82.6)					
A, B, C, D, E, or F	02606	1.50 (38.1)	0.625 (15.9)					
	02608	2.00 (50.8)	1.125 (28.6)					
	02610	2.50 (63.5)	1.625 (41.3)	0.750	6	0.44	0.706	0.731
	02612	3.00 (76.2)	2.125 (54)	(19.1)		(11.1)	(17.9)	(18.6)
	02614	3.50 (88.9)	2.625 (66.7)					
	02616	4.00 (101.6)	3.125 (79.4)					
A, B, C, D, E, or F	02706	1.50 (38.1)	0.375 (9.5)					
	02708	2.00 (50.8)	0.875 (22.2)					
	02710	2.50 (63.5)	1.375 (34.9)	0.875	7	0.50	0.819	0.844
	02712	3.00 (76.2)	1.875 (48.1)	(22.2)		(12.7)	(20.8)	(21.4)
	02714	3.50 (88.9)	2.375 (60.3)					
	02716	4.00 (101.6)	2.875 (73)					

^a Further details for measurements of standard electrode tapers can be found in the Supplemental Materials in Annex B.

Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, Tables 1.8.18 and 1.8.19, pp. 1-8-24 to 1.8.27, January 1996.



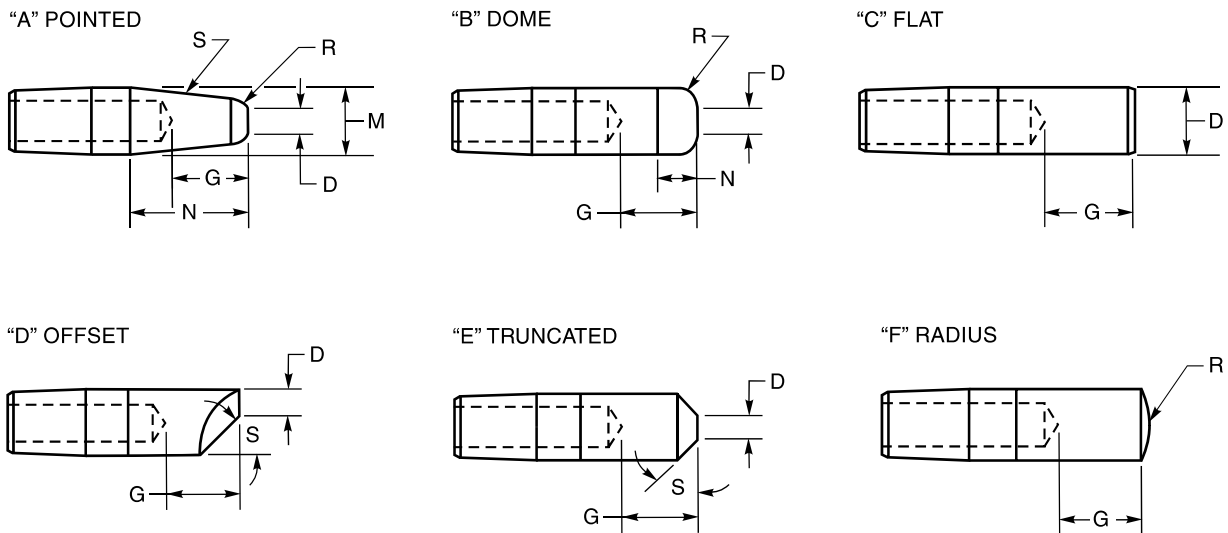
Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.16, p. 1-8-25, January 1996.

Figure 12—Standard for Straight Electrodes

Table 15
Standard Dimensions for Standard Straight Electrode Noses

Nose Style	RWMA Taper Size	M Major Dia. in (mm)	G Distance to Face in (mm) Tol. ± 0.013 in (0.8 mm)	D Diameter of Flat in (mm) Tol. ± 0.015 in (0.4 mm)	N Nose Length in (mm) Tol. ± 0.03 in (0.8 mm)	R Radius in (mm) Tol. ± 0.010 in (0.25 mm)	S Angle Tol. $\pm 0^\circ 30'$
A—Pointed	4	0.482 or 0.50 (12.7)	0.50 (12.7)	0.19 (4.8)	0.75 (19.1)	0.16 (4.1)	6°
B—Dome				0.19 (4.8)	0.25 (6.4)	0.16 (4.1)	—
C—Flat				Stock Size	—	—	—
D—Offset				0.19 (4.8)	—	—	50°
E—Truncated				0.19 (4.8)	—	—	45°
F—Radius				—	—	2 (50.8)	—
A—Pointed	5	0.625 (15.8)	0.75 (19.1)	0.25 (6.4)	0.88 (22.2)	0.22 (5.6)	6°
B—Dome				0.25 (6.4)	0.38 (9.5)	0.22 (5.6)	—
C—Flat				Stock Size	—	—	—
D—Offset				0.25 (6.4)	—	—	45°
E—Truncated				0.25 (6.4)	—	—	45°
F—Radius				—	—	2 (50.8)	—
A—Pointed	6	0.75 (19.1)	0.75 (19.1)	0.28 (7.1)	1 (25.4)	0.28 (7.1)	6°
B—Dome				0.28 (7.1)	0.38 (9.5)	0.28 (7.1)	—
C—Flat				Stock Size	—	—	—
D—Offset				0.28 (7.1)	—	—	45°
E—Truncated				0.28 (7.1)	—	—	45°
F—Radius				—	—	4 (101.6)	—
A—Pointed	7	0.875 (22.2)	0.75 (19.1)	0.31 (7.9)	1.12 (28.6)	0.34 (8.6)	6°
B—Dome				0.31 (7.9)	0.38 (9.5)	0.34 (8.6)	—
C—Flat				Stock Size	—	—	—
D—Offset				0.31 (7.9)	—	—	45°
E—Truncated				0.31 (7.9)	—	—	45°
F—Radius				—	—	4 (101.6)	—

Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, Tables 1.8.18 and 1.8.19, pp. 1-8-25 to 1-8-26, January 1996.



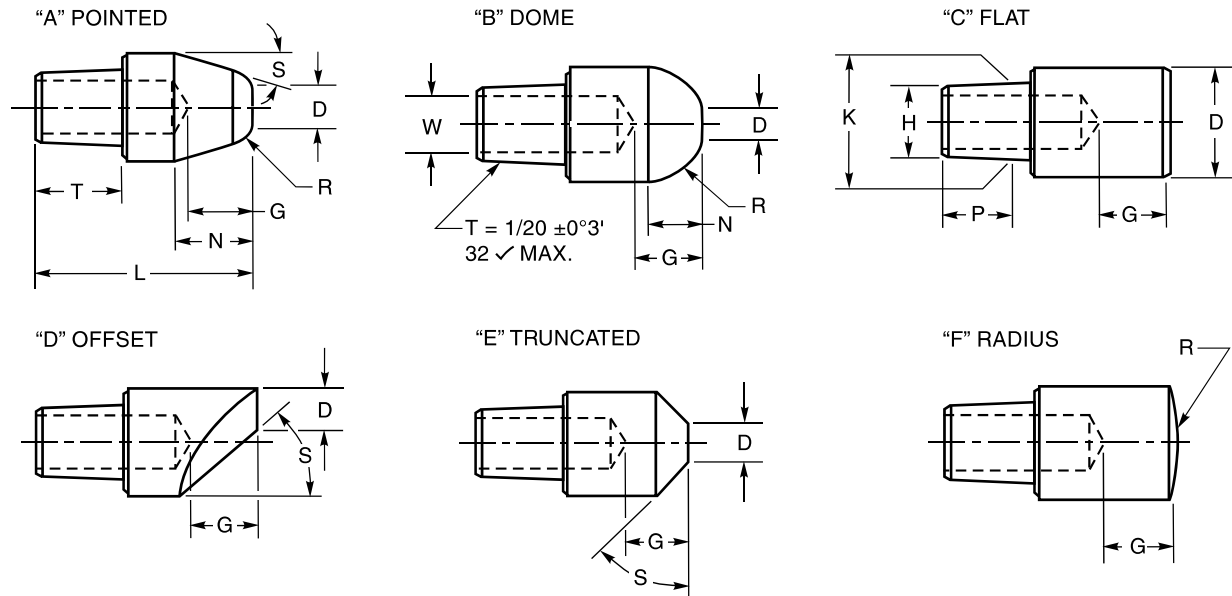
Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.16, p. 1-8-24, January 1996.

Figure 13—Nose Configurations for Standard Straight Electrodes

Table 16
Standard Dimensions for Male Cap Electrodes

Nose Style	RWMA Taper Size	M Major Dia. in (mm)	G Distance to Face in (mm) Tol.	D Diameter of Flat in (mm) Tol.	N Nose Length in (mm) Tol.	R Radius in (mm) Tol.	S Angle in (mm) Tol.	L Overall Length in (mm) Tol.	T Taper Length in (mm)	W Water Hole Dia. in (mm) Tol.	H Minor Taper Dia. in (mm) (Ref.)	Dia. K @ Dim. P in (mm) Tol. +0.000/-0.000 in (+0.025/-0.000 mm)
A—Pointed												
B—Dome		0.482		0.19 (4.8)	0.38 (9.5)	0.16 (4.1)	18°15'					
C—Flat	4	or 0.50 (12.7)	3/8 (9.5)	Stock Size	0.25 (6.4)	0.16 (4.1)	—	1.125 (28.6)	0.38 (9.5)	0.28 (7.1)	0.361 (9.2)	0.375 @ 0.275 (9.5 @ 7.0)
D—Offset				0.19 (4.8)	—	—	50°					
E—Truncated				0.19 (4.8)	—	—	45°					
F—Radius				—	—	2.00 (50.1)	—					
A—Pointed												
B—Dome				0.25 (6.4)	0.50 (12.7)	0.22 (5.6)	15°30'					
C—Flat	5	0.625 (15.8)	3/8 (9.5)	Stock Size	0.25 (6.4)	0.22 (5.6)	—	1.25 (31.8)	0.50 (12.7)	0.31 (7.9)	0.396 (10.1)	0.415 @ 0.390 (10.5 @ 9.6)
D—Offset				0.25 (6.4)	—	—	45°					
E—Truncated				0.25 (6.4)	—	—	45°					
F—Radius				—	—	2.00 (50.1)	—					
A—Pointed												
B—Dome				0.28 (7.1)	0.75 (19.1)	0.28 (7.1)	13°30'					
C—Flat	6	0.750 (1.19)	3/8 (9.5)	Stock Size	0.28 (7.1)	0.28 (7.1)	—	1.625 (41.3)	0.63 (16)	0.38 (12.1)	0.476 (12.1)	0.501 @ 0.500 (12.7 @ 12.7)
D—Offset				0.28 (7.1)	—	—	45°					
E—Truncated				0.28 (7.1)	—	—	45°					
F—Radius				—	—	4.00 (101.6)	—					
A—Pointed												
B—Dome				0.31 (7.9)	0.75 (19.1)	0.34 (8.6)	15°					
C—Flat	7	0.875 (22.2)	3/8 (9.5)	Stock Size	0.31 (7.9)	0.34 (8.6)	—	1.625 (41.3)	0.63 (16)	0.50 (12.7)	0.588 (14.9)	0.613 @ 0.500 (15.6 @ 12.7)
D—Offset				0.31 (7.9)	—	—	45°					
E—Truncated				0.31 (7.9)	—	—	45°					
F—Radius				—	—	4.00 (101.6)	—					

Source: Adapted from RWMA Bulletin 16, Resistance Welding Equipment Standards, Tables 1.8.20 and 1.8.21, pp. 1-8-31 to 1-8-33, January 1996.



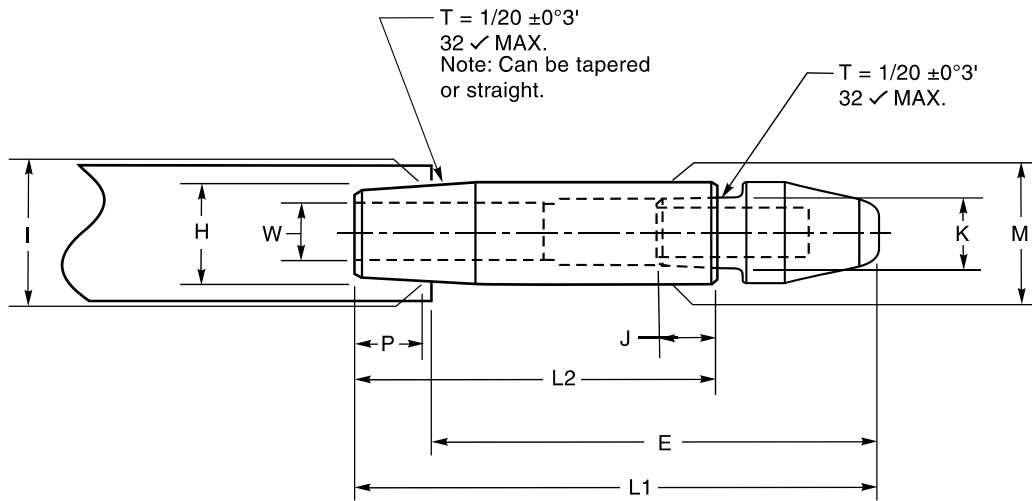
Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.19, p. 1-8-30, January 1996.

Figure 14—Standard Male Cap Electrodes

Table 17
Standard Dimensions for Straight Cap-Adaptor Shanks for Male Cap Electrodes

Cap Adaptor Shank Number	L1 OAL Assy. Length in (mm)	L2 Shank Length in (mm)	E Extension from Std. Holder (Approx.)	M Major Dia. in (mm)	T RWMA Taper Size	K Cap Taper Gauge Dia. in (mm)	J Minimum Taper Engagement in (mm)	W Water Hole Dia. in (mm)	H Minor Taper Dia. in (mm)	I Taper Dia. @ P in (mm)
SM- 2T 405	2.00 (50.8)	1.25 (31.8)	1.50 (38.1)							
2T 406	2.25 (57.2)	1.50 (38.1)	1.75 (44.5)							
2T 407	2.50 (63.5)	1.75 (44.5)	2.00 (50.8)							
2T 408	2.75 (69.9)	2.00 (50.8)	2.25 (57.2)							
2T 409	3.00 (76.2)	2.25 (57.2)	2.50 (63.5)							
2T 410	3.25 (82.6)	2.50 (63.5)	2.75 (69.9)	0.482 or 0.500 (12.7)	4	0.375 (9.53)	0.41 (10.3)	0.28 (7.1)	0.438 (11.12)	0.463 @ 0.50 (11.76 @ 1.27)
2T 411	3.50 (88.9)	2.75 (69.9)	3.00 (76.2)							
2T 412	3.75 (95.3)	3.00 (76.2)	3.25 (82.6)							
2T 413	4.00 (101.6)	3.25 (82.6)	3.50 (88.9)							
2T 414	4.25 (107.9)	3.50 (88.9)	3.75 (95.3)							
2T 415	4.50 (114.3)	3.75 (95.3)	4.00 (101.6)							
2T 416	4.75 (120.7)	4.00 (101.6)	4.25 (107.9)							
SM- 2T 505	2.00 (50.8)	1.25 (31.8)	1.25 (31.8)							
2T 506	2.25 (57.2)	1.50 (38.1)	1.50 (38.1)							
2T 507	2.50 (63.5)	1.75 (44.5)	1.75 (44.5)							
2T 508	2.75 (69.9)	2.00 (50.8)	2.00 (50.8)							
2T 509	3.00 (76.2)	2.25 (57.2)	2.25 (57.2)							
2T 510	3.25 (82.6)	2.50 (63.5)	2.50 (63.5)							
2T 511	3.50 (88.9)	2.75 (69.9)	2.75 (69.9)	0.625 (15.8)	5	0.415 (10.54)	0.53 (13.5)	0.38 (9.5)	0.588 (14.94)	0.613 @ 0.50 (15.57 @ 1.27)
2T 512	3.75 (95.3)	3.00 (76.2)	3.00 (76.2)							
2T 513	4.00 (101.6)	3.25 (82.6)	3.25 (82.6)							
2T 514	4.25 (107.9)	3.50 (88.9)	3.50 (88.9)							
2T 515	4.50 (114.3)	3.75 (95.3)	3.75 (95.3)							
2T 516	4.75 (120.7)	4.00 (101.6)	4.00 (101.6)							
SM- 2T 608	3.00 (76.2)	2.00 (50.8)	2.125 (54)							
2T 610	3.50 (88.9)	2.50 (63.5)	2.625 (66.7)							
2T 612	4.00 (101.6)	3.00 (76.2)	3.125 (79.4)	0.750 (19)	6	0.501 (12.73)	0.66 (16.7)	0.44 (11.1)	0.706 (17.93)	0.713 @ 0.50 (18.57 @ 1.27)
2T 614	4.50 (114.3)	3.50 (88.9)	3.625 (92.1)							
2T 616	5.00 (127)	4.00 (101.6)	4.125 (104.8)							
SM- 2T 708	3.00 (76.2)	1.00 (25.4)	1.875 (48.1)							
2T 712	4.00 (101.6)	3.00 (76.2)	2.875 (73)	0.875 (22)	7	0.613 (15.57)	0.66 (16.7)	0.50 (12.7)	0.819 (20.80)	0.844 @ 0.50 (21.44 @ 12.7)
2T 716	5.00 (127)	4.00 (101.6)	3.875 (98.4)							

Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, Table 1.8.22, p. 1-8-35, January 1996.



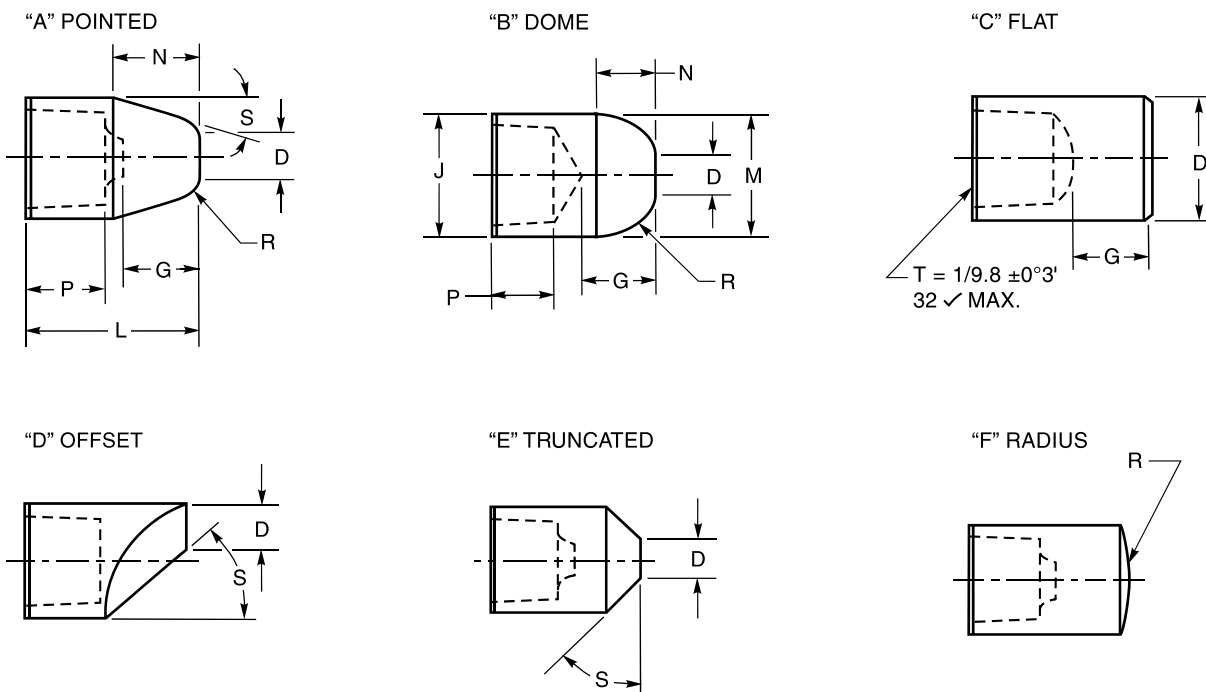
Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.21, p. 1-8-34, January 1996.

Figure 15—Cap-Adaptor Shanks for Male Cap Electrodes

Table 18
Standard Dimensions for Female Cap Electrodes

Nose Style	RWMA Taper Size T = 1/9.8	M Major Dia. in (mm)	G Distance to Face in (mm) Tol. ±0.03 in (0.76 mm)	D Diameter of Flat in (mm) Tol. ±0.015 in (0.38 mm)	N Nose Length in (mm) Tol. ±0.03 in (0.76 mm)	R Radius Tol. ±0.010 in (0.25 mm)	S Angle Tol. ±0.010 in (0.25 mm)	L Overall Length Tol. ±0.010 in (0.25 mm)	J Major Taper Dia. Tol. +0.001/-0.000 in (0.025/0.000 mm)	P Taper Dept. Tol. +0.020/-0.000 in (0.51/0.00 mm)
A—Pointed				0.19 (4.8)	0.38 (9.5)	0.16 (4.1)	15°20'			
B—Dome				0.19 (4.8)	0.25 (6.4)	0.16 (4.1)	—			
C—Flat	4	0.482 or 0.500 (12.7)	0.46 (11.7)	Stock Size	—	—	—	0.84 (21.3)	0.3940 (10.01)	0.360 (9.1)
D—Offset				0.19 (4.8)	—	—	50°			
E—Truncated				0.19 (4.8)	—	—	45°			
F—Radius				—	—	2.00 (50.1)	—			
A—Pointed				0.25 (6.4)	0.50 (12.7)	0.22 (5.6)	17°			
B—Dome				0.25 (6.4)	0.38 (9.5)	0.22 (5.6)	—			
C—Flat	5	0.625 (15.8)	0.37 (9.4)	Stock Size	—	—	—	0.88 (20.3)	0.4946 (12.56)	0.392 (9.9)
D—Offset				0.25 (6.4)	—	—	45°			
E—Truncated				0.25 (6.4)	—	—	45°			
F—Radius				—	—	2.00 (50.1)	—			
A—Pointed				0.28 (7.1)	0.75 (19.1)	0.28 (7.1)	20°			
B—Dome				0.28 (7.1)	0.38 (9.5)	0.28 (7.1)	—			
C—Flat	6	0.750 (19.1)	0.37 (9.4)	Stock Size	—	—	—	1.000 (25.4)	0.625 (15.88)	0.434 (11.0)
D—Offset				0.28 (7.1)	—	—	45°			
E—Truncated				0.28 (7.1)	—	—	45°			
F—Radius				—	—	4.00 (101.6)	—			

Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, Table 1.8.23, p. 1-8-39, January 1996.



Note: Drawings A, B, C, and D denote representative forms of water hole configuration.

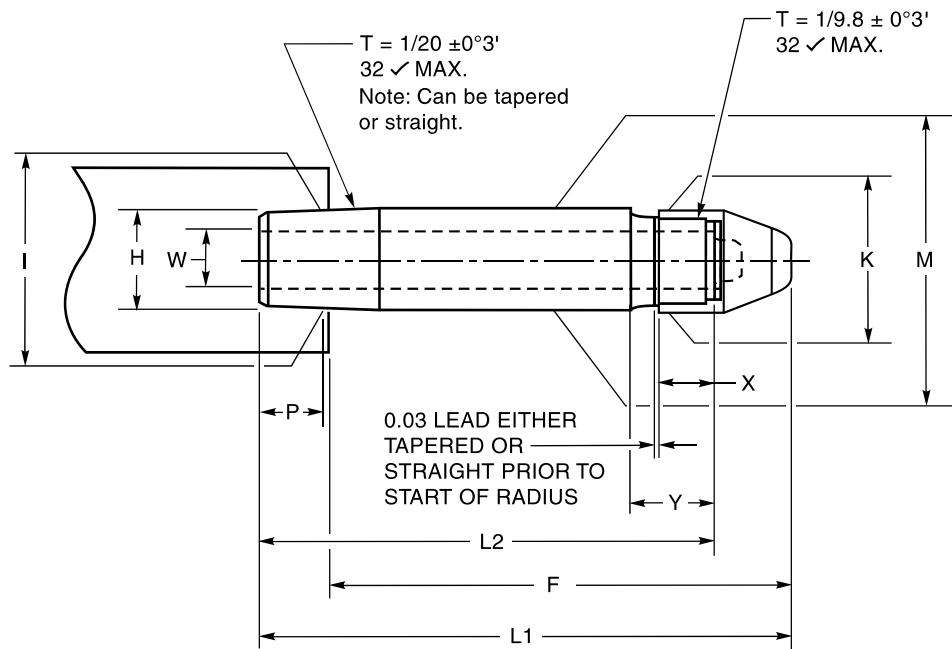
Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.24, p. 1-8-38, January 1996.

Figure 16—Standard Female Cap Electrodes

Table 19
Standard Dimensions for Straight Cap-Adaptor Shanks for Female Cap Electrodes

Cap Adaptor Shank Number	L1 OAL Assy. Length in (mm)	L2 Shank Length in (mm)	E Extension From Std. Holder (Approx.) in (mm)	M Major Dia. in (mm)	T RWMA Taper Size	K Cap Taper Gauge Dia. in (mm)	X Taper Engagement in (mm)	W Water Hole Dia. in (mm)	H Minor Taper Dia. (Ref.) in (mm)	I Taper Dia. @ P in (mm)	Y Taper Length in (mm)
SF- 2T 405	1.85 (47)	1.25 (31.8)	1.35 (34.3)								
2T 406	2.10 (53.3)	1.50 (38.1)	1.60 (40.6)								
2T 407	2.35 (59.7)	1.75 (44.5)	1.85 (46.9)								
2T 408	2.60 (66.0)	2.00 (50.8)	2.10 (53.3)								
2T 409	2.85 (72.4)	2.25 (57.2)	2.35 (59.7)	0.482							
2T 410	3.10 (78.7)	2.50 (63.5)	2.60 (66.0)	or							
2T 411	3.35 (85.1)	2.75 (69.9)	2.85 (72.4)	0.500	4	0.402	0.380	0.28	0.438	0.463 @ 0.50	0.450
2T 412	3.60 (91.4)	3.00 (76.2)	3.10 (78.7)	(12.7)		(10.21)	(9.65)	(7.1)	(11.13)	(11.76 @ 1.27)	(11.43)
2T 413	3.85 (97.8)	3.25 (82.6)	3.35 (85.1)								
2T 414	4.10 (104.1)	3.50 (88.9)	3.60 (91.4)								
2T 415	4.35 (110.5)	3.75 (95.3)	3.85 (97.8)								
2T 416	4.60 (116.8)	4.00 (101.6)	4.10 (104.1)								
SF- 2T 505	1.89 (48.0)	1.25 (31.8)	1.14 (28.9)								
2T 506	2.14 (54.4)	1.50 (38.1)	1.39 (35.3)								
2T 507	2.39 (60.7)	1.75 (44.5)	1.64 (41.7)								
2T 508	2.64 (67.1)	2.00 (50.8)	1.89 (48.0)								
2T 509	2.89 (73.4)	2.25 (57.2)	2.14 (54.4)								
2T 510	3.14 (79.8)	2.50 (63.5)	2.39 (60.7)	0.625	5	0.502	0.359	0.38	0.588	0.613 @ 0.50	0.442
2T 511	3.39 (86.1)	2.75 (69.9)	2.64 (67.1)	(15.8)		(12.75)	(9.12)	(9.5)	(14.94)	(15.57 @ 1.27)	(11.23)
2T 512	3.64 (92.5)	3.00 (76.2)	2.89 (73.4)								
2T 513	3.89 (98.8)	3.25 (82.6)	3.14 (79.8)								
2T 514	4.14 (105.2)	3.50 (88.9)	3.39 (86.1)								
2T 515	4.39 (111.5)	3.75 (95.3)	3.64 (92.5)								
2T 516	4.64 (117.9)	4.00 (101.6)	3.89 (98.8)								
SF- 2T 608	3.00 (76.2)	2.00 (50.8)	2.125 (53.9)								
2T 610	3.50 (88.9)	2.50 (63.5)	2.625 (66.7)								
2T 612	4.00 (101.6)	3.00 (76.2)	3.125 (79.4)	0.750	6	0.633	0.401	0.44	0.706	0.731 @ 0.50	0.491
2T 614	4.50 (114.3)	3.50 (88.9)	3.625 (92.1)	(19.1)		(16.08)	(10.19)	(11.1)	(17.93)	(18.57 @ 1.27)	(12.47)
2T 616	5.00 (127)	4.00 (101.6)	4.125 (104.8)								

Source: Adapted from RWMA Bulletin 16, Resistance Welding Equipment Standards, Table 1.8.24, p. 1-8-41, January 1996.



Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, 1.8.25, p. 1-8-40, January 1996.

Figure 17—Cap-Adaptor Shanks for Female Cap Electrodes

Table 20
Water Tube Specifications for Tubes Inserted in Single- and Double-Bend Electrodes
(not part of RWMA standards)

Major Dia. in (mm) [RWMA Taper #]	Tube Outside Dia. in (mm)	Tube Wall Thickness in (mm)
0.482 or 0.500 (13) [#4]	0.182 (4.6)	0.017 (0.43)
0.625 (16) [#5]	0.25 (6.4)	0.032 (0.81)
0.750 (19) [#6]	0.25 (6.4)	0.032 (0.81)
0.875 (22) [#7]	0.25 (6.4)	0.032 (0.81)

Table 21
Double-Bend Electrodes Listed by the RWMA

Major Dia. in (mm) [RWMA Taper #1]	Code	OAL (Length) in (mm) (see 6.2.1.3)	Offset in (mm) (see 6.2.1.3)	Nose (see 7.2)
0.482 or 0.500 (12.7) [#4]	DA 2T 408 08	2.00 (50.8)	0.500 (12.7)	A
	DA 2T 409 08	2.25 (57.2)		
	DA 2T 410 08	2.50 (63.5)		
	DA 2T 408 12	2.00 (50.8)	0.750 (19.1)	A
	DA 2T 409 12	2.25 (57.2)		
	DA 2T 410 12	2.50 (63.5)		
	DA 2T 409 16	2.25 (57.2)	1.000 (25.4)	A
	DA 2T 410 16	2.50 (63.5)		
	DA 2T 411 16	2.75 (69.9)		
	DA 2T 412 16	3.00 (76.2)		
	DA 2T 413 16	3.25 (82.6)		
	DA 2T 414 16	3.50 (88.9)		
	DA 2T 410 20	2.50 (63.5)	1.250 (31.8)	A
	DA 2T 411 20	2.75 (69.9)		
	DA 2T 412 20	3.00 (76.2)		
0.625 (16) [#5]	DA 2T 510 08	2.50 (63.5)	0.500 (12.7)	A
	DA 2T 511 08	2.75 (69.9)		
	DA 2T 512 08	3.00 (76.2)		
	DA 2T 513 08	3.25 (82.6)		
	DA 2T 511 12	2.75 (69.9)	0.750 (19.1)	A
	DA 2T 512 12	3.00 (76.2)		
	DA 2T 513 12	3.25 (82.6)		
	DA 2T 511 16	2.75 (69.9)	1.000 (25.4)	A
	DA 2T 512 16	3.00 (76.2)		
	DA 2T 513 16	3.25 (82.6)		
	DA 2T 514 16	3.50 (88.9)		
	DA 2T 511 20	2.75 (69.9)	1.250 (31.8)	A
	DA 2T 512 20	3.00 (76.2)		
	DA 2T 513 20	3.25 (82.6)		
	DA 2T 514 20	3.50 (88.9)		
	DA 2T 511 24	2.75 (69.9)	1.500 (38.1)	A
	DA 2T 511 28	2.75 (69.9)		
			1.750 (44.5)	A

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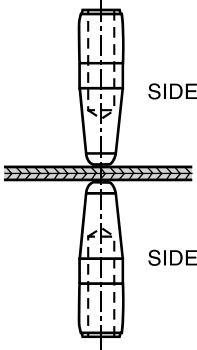
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Annex A (Informative)

Recommended Electrode Materials for Spot Welding Dissimilar and Similar Metals

This annex is not a part of AWS D8.6:2005, *Specification for Automotive Resistance Spot Welding Electrodes*, but is included for informational purposes only.

DISSIMILAR FERROUS METALS														
SIDE 2 METAL	SIDE 1 METAL													
	NICKEL & NICKEL ALLOYS		COLD-ROLLED STEEL		TIN PLATE		TERNE PLATE		GALVANIZED STEEL		CADMIUM PLATE		CHROME PLATE	
STAINLESS STEEL	B	2	A	2	B	1, 2, 20	B	1, 2, 20	B	1, 2, 20	B	1, 2, 20	B	2
	2, 3		2, 3		2, 3		2, 3		2, 3		2, 3		2, 3	
CHROME PLATE	B	2	B	2	B	1, 2, 20	B	1, 2, 20	B	1, 2, 20	B	1, 2, 20		
	2		2		2		2		1, 2, 20		2			
CADMIUM PLATE	B	2	B	2	C	1, 20 20	B	1, 2, 20	B	1, 2, 20				
	1, 2, 20		2		1, 2, 20		1, 2, 20		1, 2, 20					
GALVANIZED STEEL	C	2	B	2	B	1, 2, 20	C	1, 2, 20						
	1, 2, 20		1, 2, 20		1, 2, 20		1, 2, 20							
TERNE PLATE	C	2	B	2	C	1, 2, 20								
	1, 2, 20		1, 2, 20		1, 2, 20									
TIN PLATE	C	2	B	2										
	1, 2, 20		1, 2, 20											
COLD-ROLLED STEEL	C	2												
	2													

	BLOCK INTERPRETATION	
	WELDABILITY	RWMA ELECTRODE CLASS
	RWMA ELECTRODE CLASS	
	A = EXCELLENT B = GOOD C = FAIR	(See Table 1) for SIDE 1
	(See Table 1) for SIDE 2	

Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, Table 1.8.11.5, p. 1-8-14, January 1996.

SIMILAR FERROUS METALS														
	STAINLESS STEEL		GALVANIZED STEEL		TIN PLATE		TERNE PLATE		CADMIUM PLATE		CHROME PLATE		COLD-ROLLED STEEL	
Side 1	A	2,3 ^a	A	1, 2, 20	B	1, 2, 20	B	1, 2, 20	A	1, 2, 20	A	2	A	2
Side 2	2, 3		2, 3		2, 3		2, 3		2, 3		2, 3		2, 3	

SIMILAR NONFERROUS METALS														
	ALUMINUM/ ALUMINUM ALLOYS		COPPER		NICKEL- SILVER		NICKEL & NICKEL ALLOYS		PHOSPHOR BRONZE		YELLOW BRASS		RED BRASS	
Side 1	A	1	C	13, 14	A	2	A	2	A	2	A	2	A	2
Side 2	1		13, 14		2		2		2		2		2	

SIMILAR NONFERROUS METALS													
	MAGNESIUM		TITANIUM		SILICON		BRONZE		CUPRO- NICKEL		NICKEL		
Side 1	B	1	A	2, 3	A	2	B	2	A	2	B	2	
Side 2	1		2, 3		2		2		2		2		

REFRACTORY METALS									
	TUNGSTEN MOLYBDENUM		CHROME PLATE		STAINLESS STEEL		NICKEL & NICKEL ALLOYS		
Side 1	B	2	B	2, 3	B	2, 3 ^a	B	2	
Side 2	2		2		2, 3 ^a		2		

^aIndicates a second choice of alloy class which can be used, however the same electrode alloy should be used on both sides for all materials.

BLOCK INTERPRETATION	
WELDABILITY A = EXCELLENT B = GOOD C = FAIR	RWMA ELECTRODE CLASS (See Table 1) for SIDE 1
RWMA ELECTRODE CLASS (See Table 1) for SIDE 2	

Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, Tables 1.8.11.1 to 1.8.11.4, p. 1-8-13, January 1996.

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Annex B (Informative)

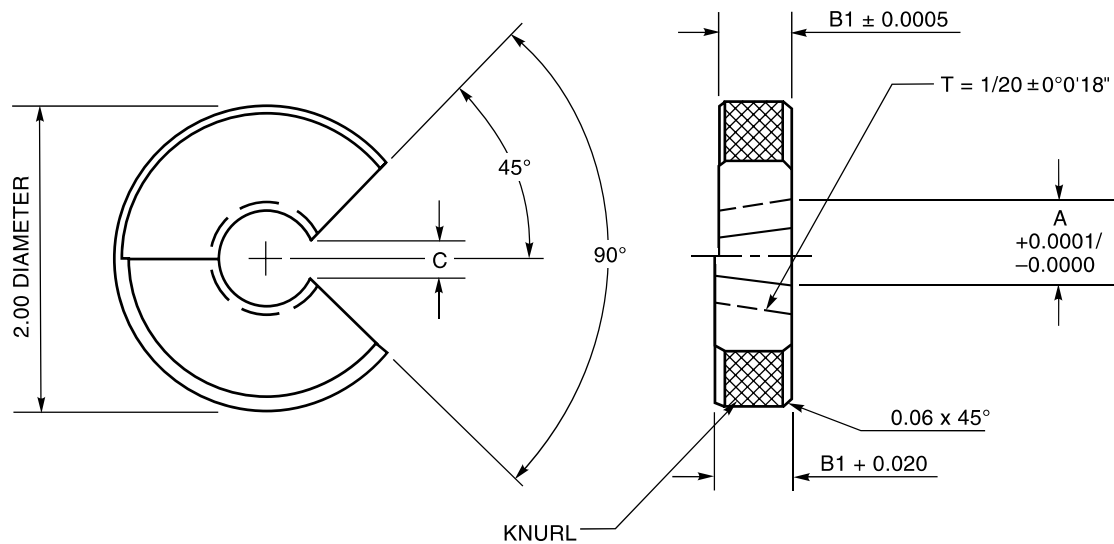
Standard Gauges for Confirmation of RWMA “Standard Electrode Tapers”

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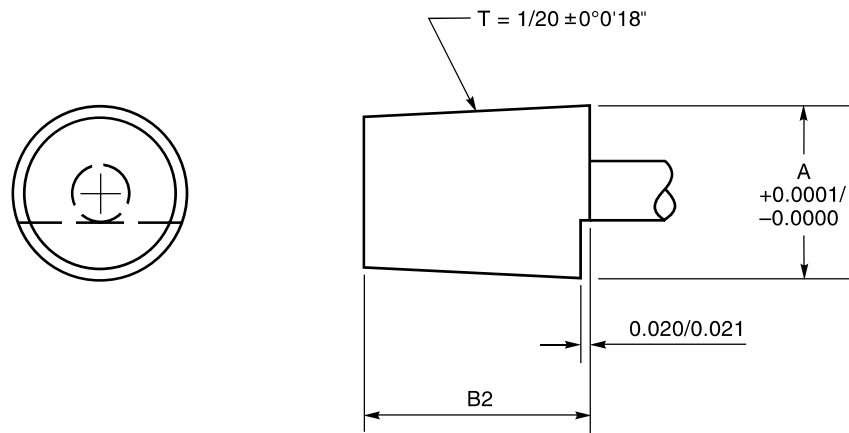
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(See 6.2.1 straight, 6.2.2 single-bend, 6.2.3 double-bend, and 6.4 holder end of cap-adaptor shanks.)

STANDARD ELECTRODE RING GAGE



STANDARD ELECTRODE PLUG GAGE



RWMA Taper	A Dim. in (mm)	B1 Dim. in (mm)	B2 Dim. in (mm)	C Dim. in (mm)
#4	0.463 (11.7)	0.500 (12.7)	0.560 (14.2)	0.10 (2.5)
#5	0.625 (15.9)	0.750 (19.1)	0.810 (20.6)	0.25 (6.4)
#6	0.750 (19.1)	0.875 (22.2)	0.935 (23.7)	0.25 (6.4)
#7	0.875 (22.2)	1.125 (28.6)	1.185 (30.1)	0.25 (6.4)

Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, Figure 1.8.6, p. 1-8-48, January 1996.

Annex C (Informative)

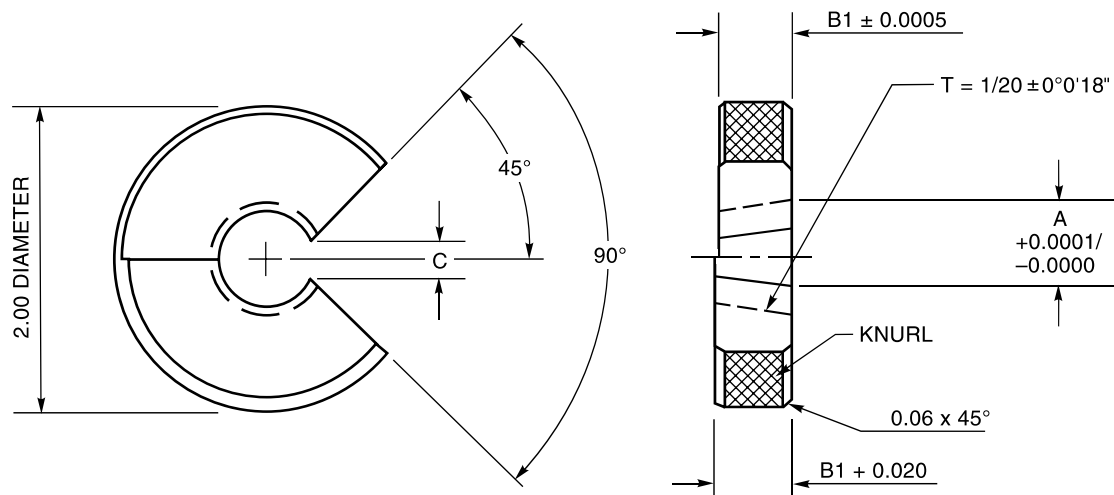
Standard Gauges for Confirmation of RWMA “Standard Male Cap Electrode Tapers”

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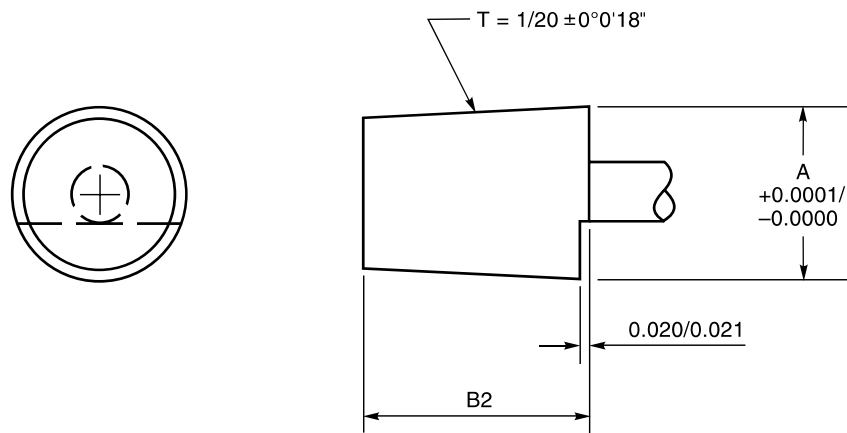
(See 8.1 male cap electrodes and 8.2 cap end of cap-adaptor shanks for male cap electrodes.)

MALE CAP ELECTRODE RING GAGES



RWMA Cap Taper	A Dim. in (mm)	B1 Dim. in (mm)	C Dim. in (mm)
#4	0.375 (9.5)	0.285 (7.2)	0.09 (2.3)
#5	0.415 (10.5)	0.390 (9.9)	0.10 (2.5)
#6	0.501 (12.7)	0.500 (12.7)	0.10 (2.5)
#7	0.613 (15.6)	0.500 (12.7)	0.10 (2.5)

MALE CAP ELECTRODE SHANK PLUG GAGES



RWMA Cap Taper	A Dim. in (mm)	B2 Dim. in (mm)
#4	0.375 (9.5)	0.405 (10.3)
#5	0.415 (10.5)	0.530 (13.5)
#6	0.501 (12.7)	0.655 (16.6)
#7	0.613 (15.6)	0.655 (16.6)

Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, Figure 1.8.5, p. 1-8-47, January 1996.

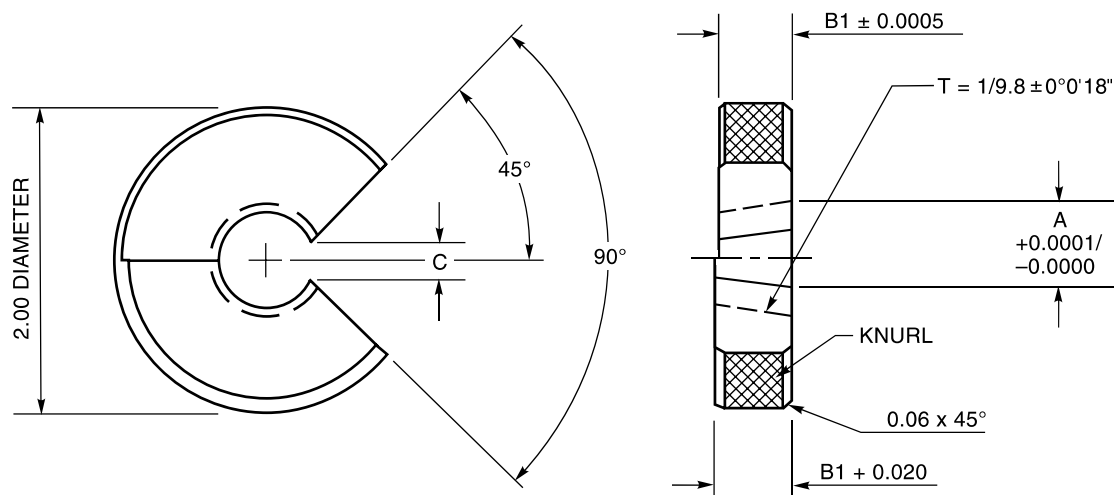
Annex D (Informative)

Standard Gauges for Confirmation of RWMA “Standard Female Cap Electrode Tapers”

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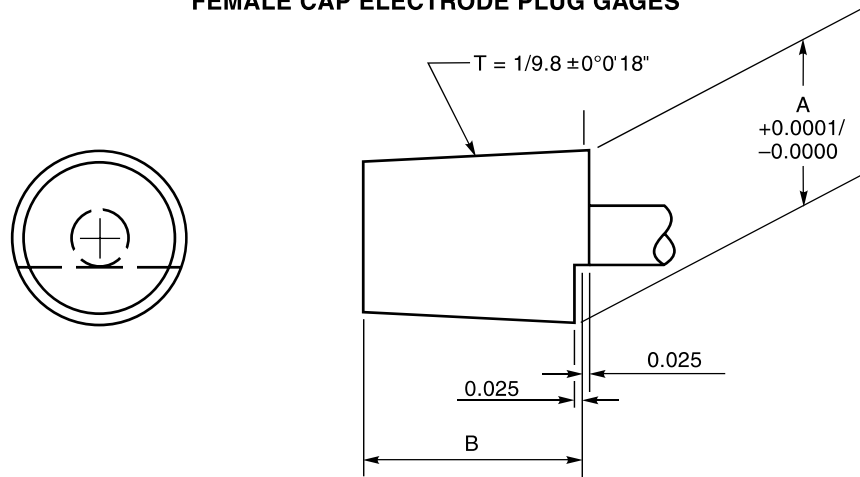
(See 8.3 female cap electrodes and 8.4 cap end of cap-adaptor shanks for female cap electrodes.)

FEMALE CAP ELECTRODE SHANK RING GAGES



RWMA Cap Taper	A Dim. in (mm)	B1 Dim. in (mm)	C Dim in (mm)
#4	0.402 (10.2)	0.348 (8.8)	0.09 (2.3)
#5	0.502 (10.5)	0.380 (9.7)	0.10 (2.5)
#6	0.633 (16.1)	0.457 (11.6)	0.10 (2.5)

Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, Figure 1.8.4, p. 1-8-46, January 1996.

FEMALE CAP ELECTRODE PLUG GAGES

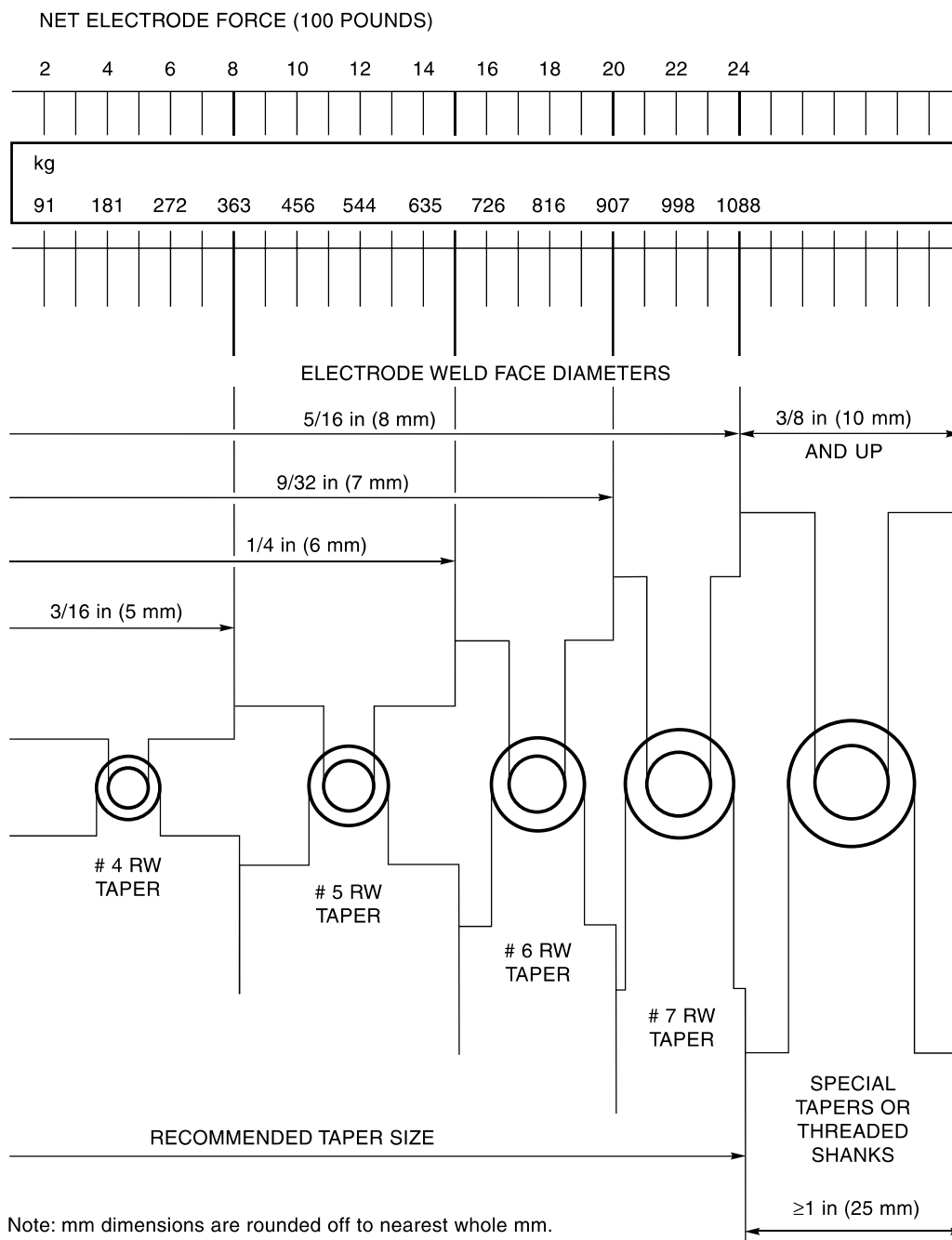
RWMA Cap Taper	A Dim. in (mm)	B Dim. in (mm)
#4	0.3940 (10.0)	0.347 (8.8)
#5	0.4946 (12.6)	0.379 (9.6)
#6	0.6250 (15.9)	0.421 (10.7)

Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, Figure 1.8.4, p. 1-8-46, January 1996.

Annex E (Informative)

Recommended Sizes of Stock RWMA Electrode Numbers and Welding Face Diameters for Use at Various Welding Force Ranges

This annex is not a part of AWS D8.6:2005, *Specification for Automotive Resistance Spot Welding Electrodes*, but is included for informational purposes only.

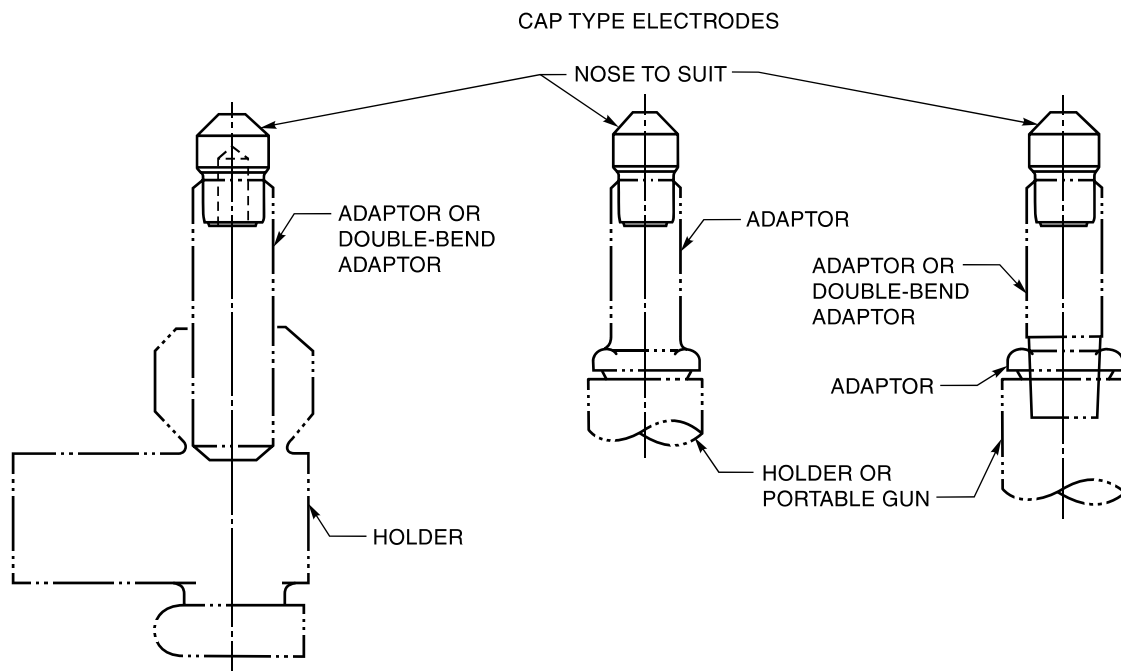


Source: Adapted from RWMA Bulletin 16, *Resistance Welding Equipment Standards*, Figure 1.8.1, p. 1-8-17, January 1996.

Annex F (Informative)

Cap Electrodes and Cap Electrode Adaptor Conventions in Common Usage by Automotive Companies

This annex is not a part of AWS D8.6:2005, *Specification for Automotive Resistance Spot Welding Electrodes*, but is included for informational purposes only.



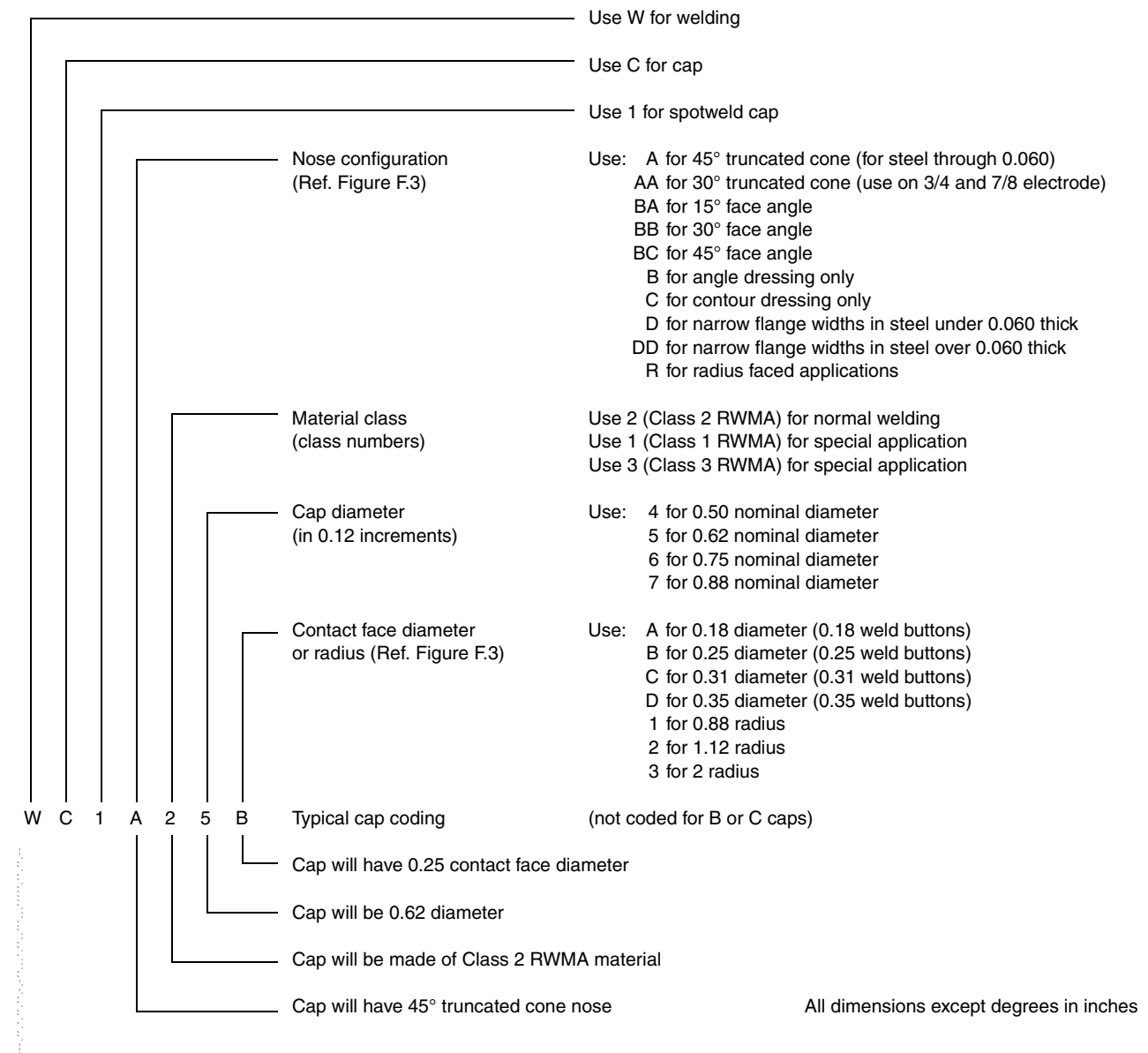


Figure F.1—Male Cap Electrodes—Ordering Codes

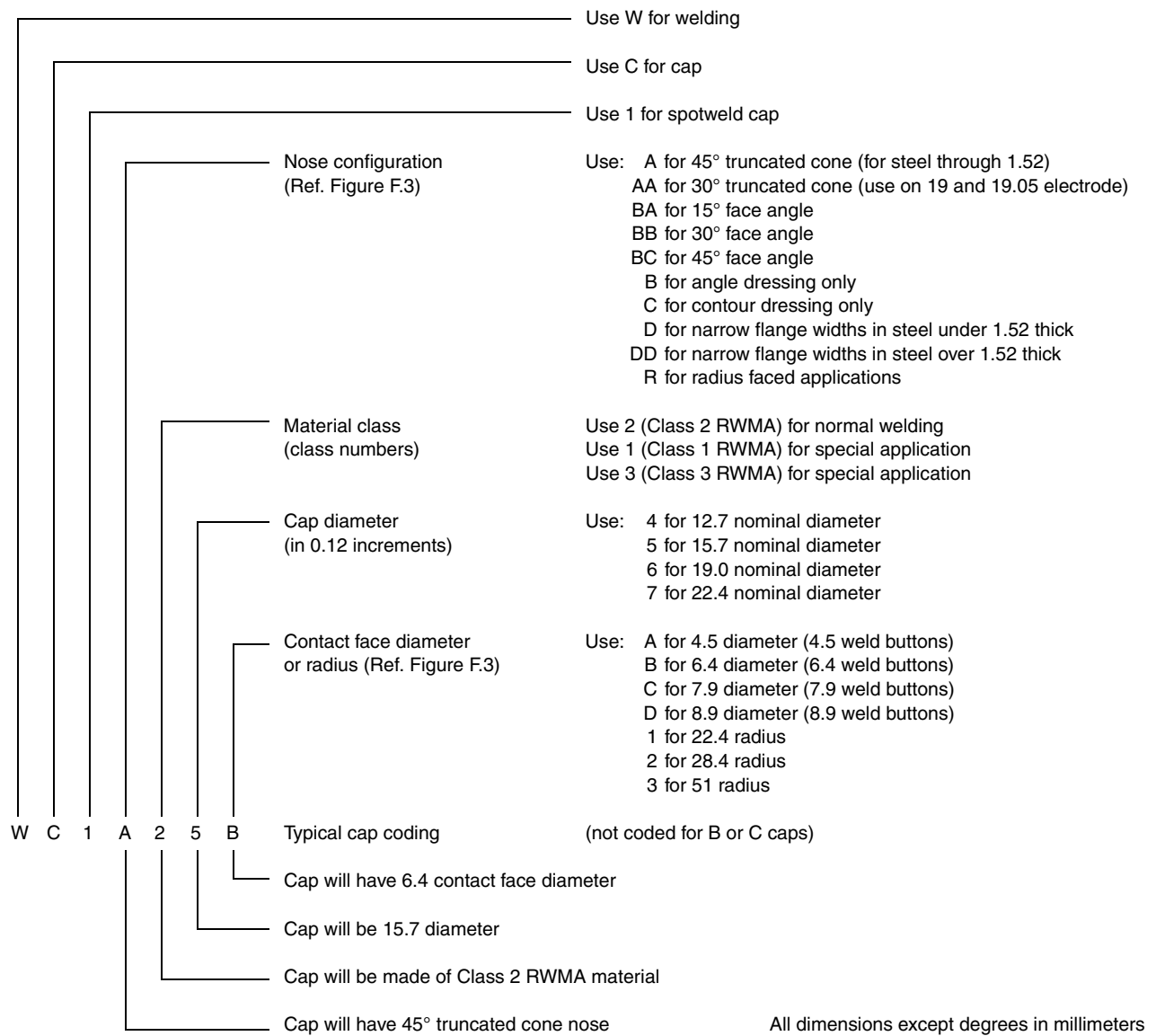
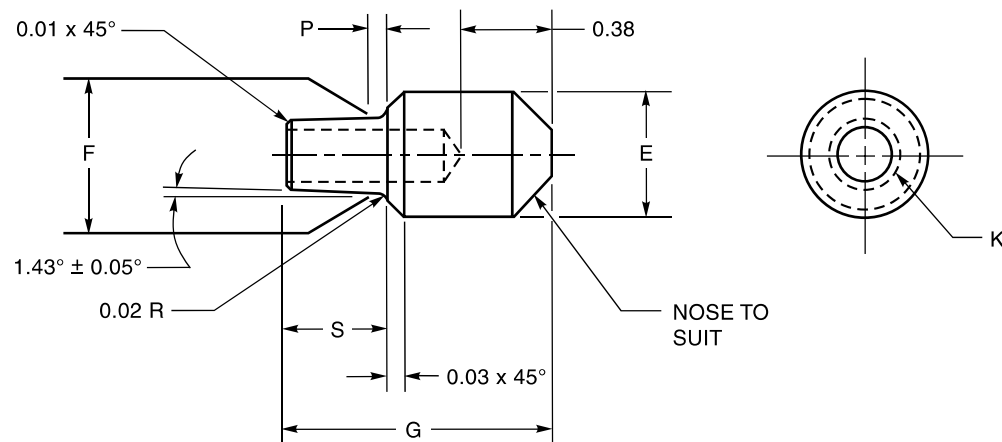
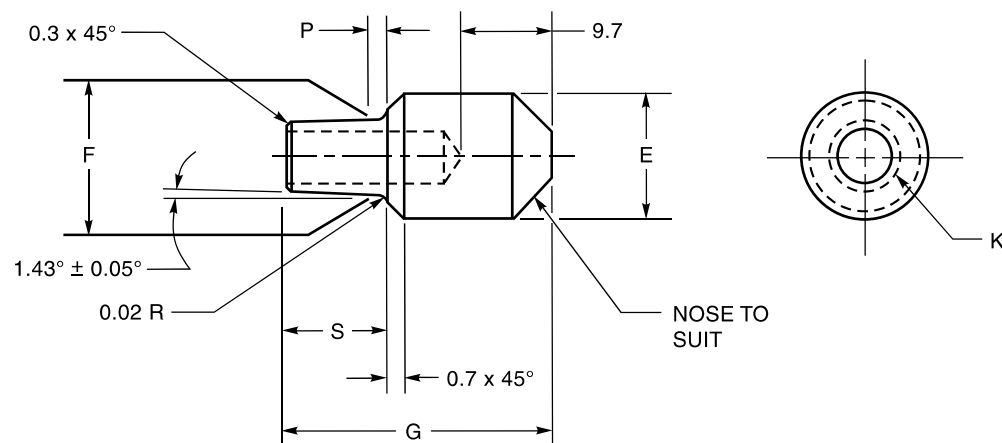


Figure F.1M—Male Cap Electrodes—Ordering Codes



All dimensions except degrees in inches

Figure F.2—Male Cap Electrode Dimensions



All dimensions except degrees in millimeters

Figure F.2M—Male Cap Electrode Dimensions

Table F.1
Standard for Male Cap Electrodes

						Tolerance
E	Diameter	1/2	5/8	3/4	7/8	±0.002
F	Taper diameter	0.314	0.415	0.501	0.701	+0.000/−0.001
G	Length	1.10	1.14	1.26	1.26	±0.010
K	Hole diameter	0.20	0.32	0.38	0.56	±0.010
P	Taper location	0.06	0.11	0.12	0.09	±0.010
S	Skirt length	0.46	0.50	0.62	0.62	±0.010
V	Flat maximum	1/8	3/16	1/4	9/32	—

Notes:

All dimensions except degrees in inches

1. Ordering and material as per code shown in Figure F.1.
2. All working surfaces to have a maximum finish of 30 μ in (arithmetic average).
3. Stamp identification mark clearly—avoid working surfaces.
4. Chemically clean caps—use a procedure to minimize oxidation and to be noninsulating in nature.

Table F.1M
Standard for Male Cap Electrodes

						Tolerance
E	Diameter	13	16	19	22	±0.05
F	Taper diameter	8.0	10.5	12.7	17.8	+0.00/−0.03
G	Length	27.9	28.9	32.0	32.0	±0.25
K	Hole diameter	5.1	8.1	9.7	14.2	±0.25
P	Taper location	1.5	2.8	3.0	2.3	±0.25
S	Skirt length	11.7	12.7	15.7	15.7	±0.25
V	Flat maximum	3.2	4.8	6.4	7.1	—

Notes:

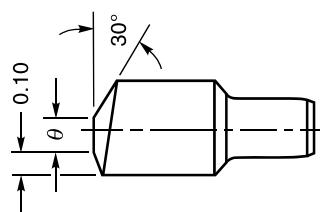
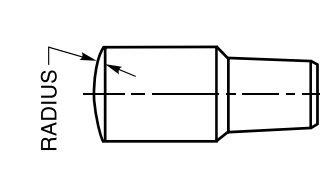
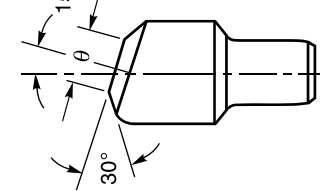
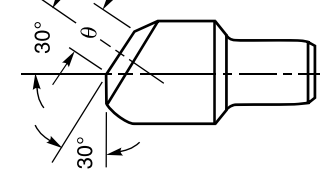
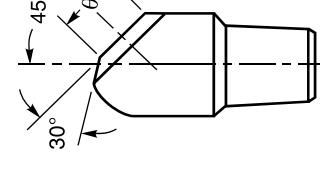
All dimensions except degrees in millimeters

1. Ordering and material as per code shown in Figure F.1.
2. All working surfaces to have a maximum finish of 0.75 μ m (arithmetic average).
3. Stamp identification mark clearly—avoid working surfaces.
4. Chemically clean caps—use a procedure to minimize oxidation and to be noninsulating in nature.

For nose application, see Figure F.1.		TYPE A				TYPE AA				TYPE B				TYPE C				TYPE D			
		1/2	5/8	3/4	7/8	1/2	5/8	3/4	7/8	1/2	5/8	3/4	7/8	1/2	5/8	3/4	7/8				
E	Diameter																				
θ-Contact Face Diameter or Radius ±0.005	A	0.18	*	*	*	*	*	*	*	*	*	*	*	0.18	0.18	*	*	*	*		
	B	*	0.25	*	*	*	*	*	*	*	*	*	*	*	0.25	0.25	0.25	*	*		
	C	*	*	*	*	*	*	*	*	*	*	*	*	*	*	0.31	0.31	*	*		
	D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		

*Not recommended

All dimensions except degrees in inches

																					
E	Diameter	1/2	5/8	3/4	7/8	1/2	5/8	3/4	7/8	1/2	5/8	3/4	7/8	1/2	5/8	3/4	7/8				
θ-Contact Face Diameter or Radius ±0.005	A	*	*	*	*	1.12R or 2.0R	1.12R or 2.0R	0.88R or 2.0R	0.88R or 2.0R	0.18	0.18	*	*	0.18	0.18	*	*				
	B	*	*	0.25	*	*	*	0.25	0.25	*	*	0.25	*	*	*	0.25	*				
	C	*	*	0.31	0.31	*	*	0.31	0.31	*	*	0.31	0.31	*	*	0.31	0.31				
	D	*	*	0.35	0.35	2.0R	2.0R	2.0R	2.0R	*	*	0.35	0.35	*	*	0.35	0.35				

*Not recommended

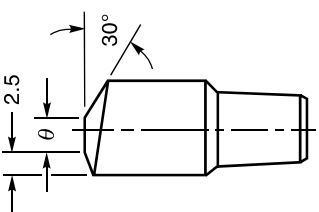
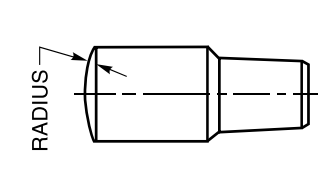
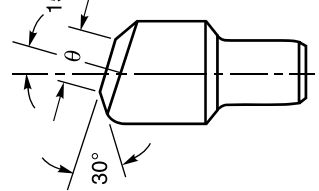
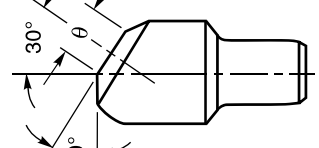
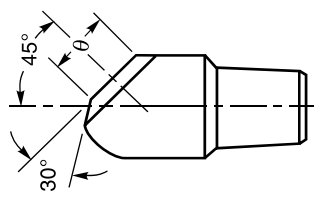
All dimensions except degrees in inches

Figure F.3—Male Cap Electrode Nose Descriptions

For nose application, see Figure F.1.		TYPE A					TYPE AA					TYPE B					TYPE C					TYPE D					
		13	16	19	22		13	16	19	22		13	16	19	22		13	16	19	22		13	16	19	22		
E	Diameter	A	4.5	4.5	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	4.5	4.5	*	*	*
		B	*	6.4	6.4	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	6.4	6.4	*	*	*
		C	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		D	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
θ-Contact Face Diameter or Radius ±0.13																											

*Not recommended

All dimensions except degrees in millimeters

		TYPE DD					TYPE R					TYPE BA					TYPE BB					TYPE BC				
																										
E	Diameter	13	16	19	22	13	16	19	22	13	16	19	22	13	16	19	22	13	16	19	22					
θ-Contact Face Diameter or Radius ±0.13	A	*	*	*	*	1.12R or 2.0R	1.12R or 2.0R	0.88R or 2.0R	0.88R or 2.0R	4.5	4.5	*	*	4.5	4.5	*	*	4.5	4.5	*	*					
	B	*	*	6.4	*	*	*	*	*	*	6.4	6.4	*	*	6.4	6.4	*	*	6.4	6.4	*	*				
	C	*	*	*	7.9	1.12R or 2.0R	2.0R	7.9	7.9	*	7.9	7.9	7.9	*	7.9	7.9	7.9	*	7.9	7.9	7.9					
	D	*	*	*	8.9	2.0R	2.0R	8.9	8.9	*	8.9	8.9	8.9	*	8.9	8.9	8.9	*	8.9	8.9	8.9					

*Not recommended

All dimensions except degrees in millimeters

Figure F.3M—Male Cap Electrode Nose Descriptions

STRAIGHT CAP ADAPTORS

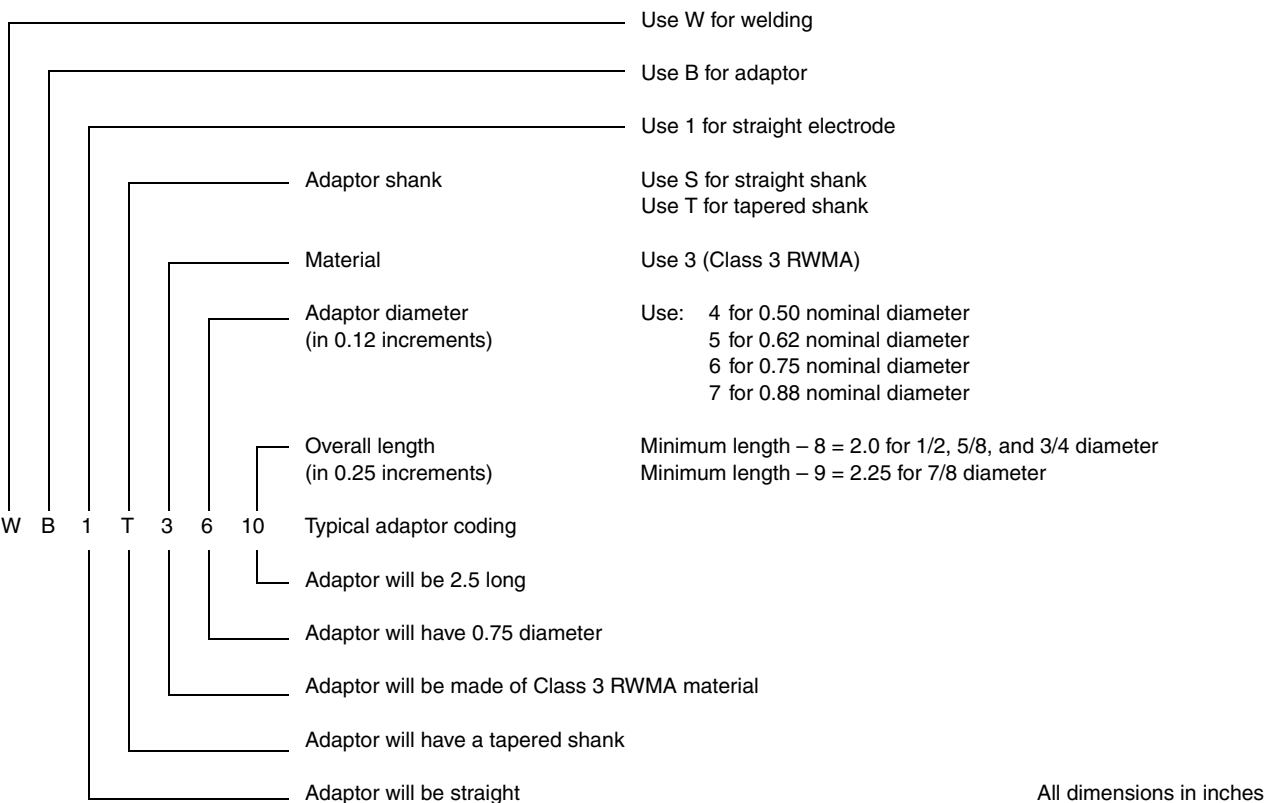
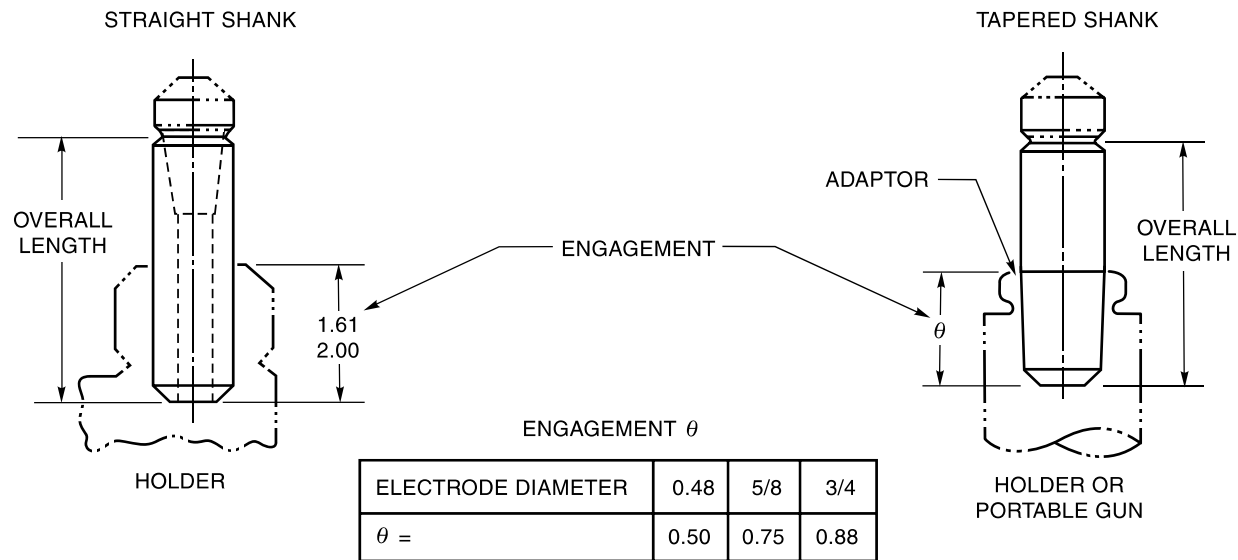


Figure F.4—Male Cap Electrode Adaptor Shanks—Ordering Codes

STRAIGHT CAP ADAPTORS

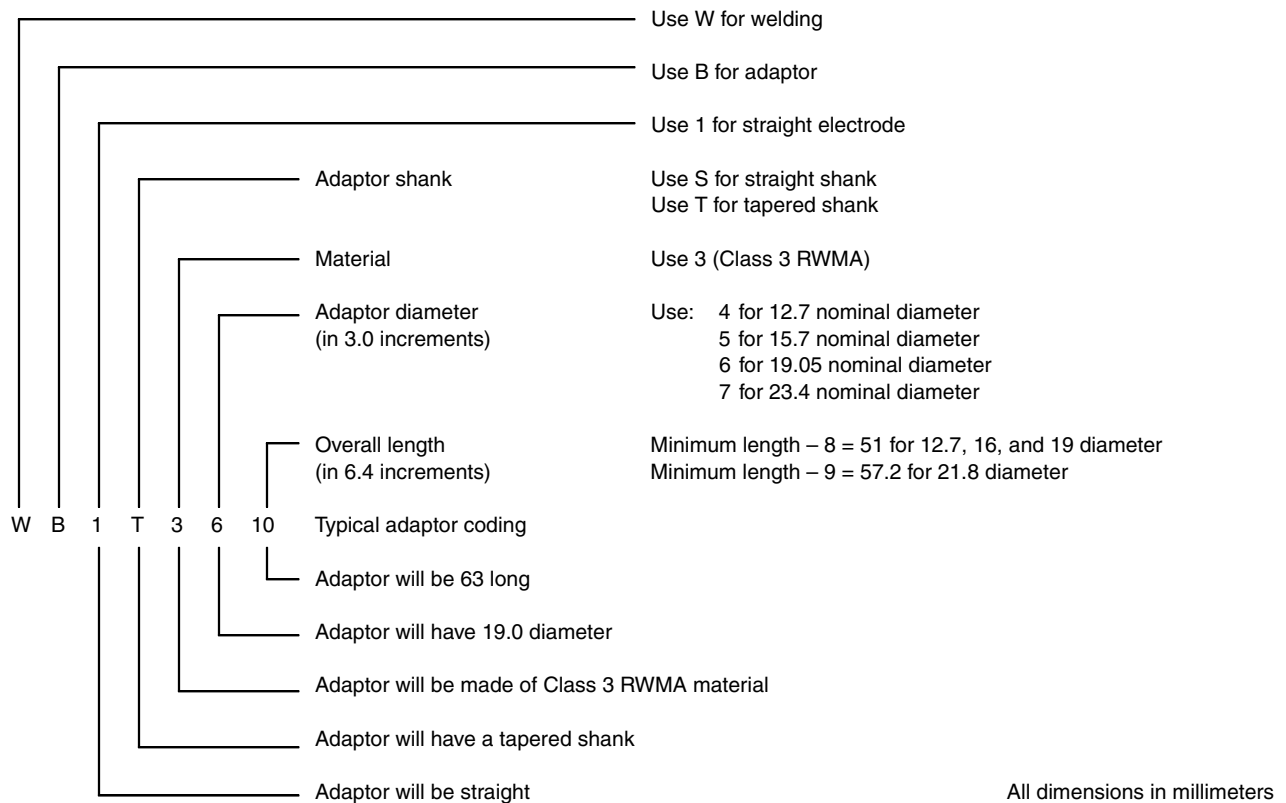
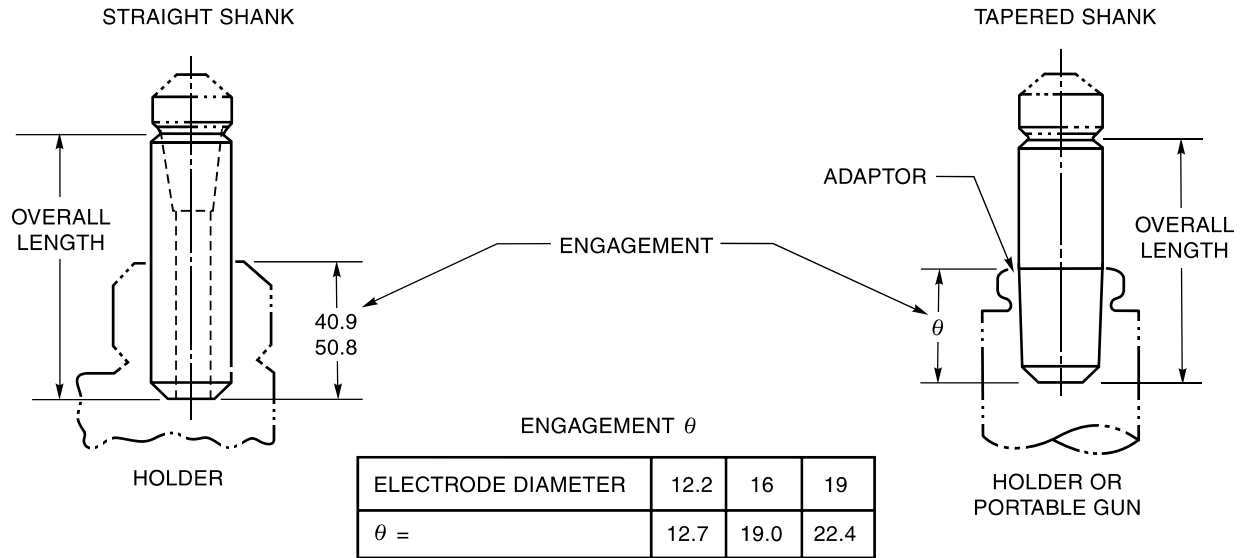
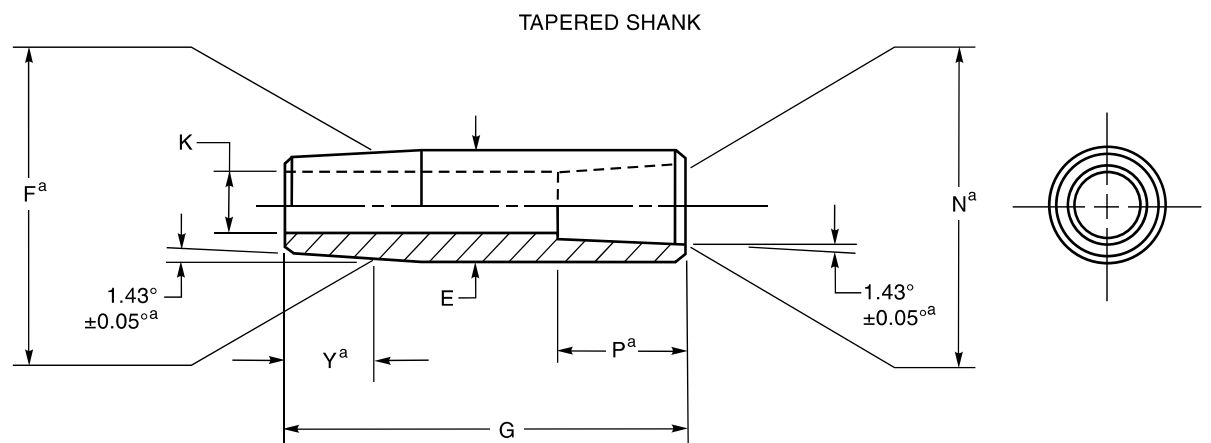


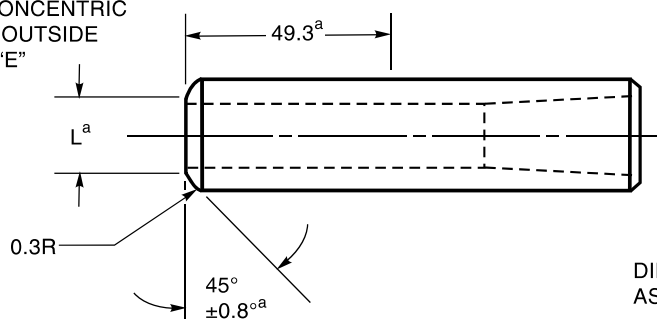
Figure F.4M—Male Cap Electrode Adaptor Shanks—Ordering Codes





LINE DIAMETER "L"
MUST BE CONCENTRIC
 ± 0.01 WITH OUTSIDE
DIAMETER "E"

STRAIGHT SHANK



DIMENSIONS NOT SHOWN ARE THE SAME
AS THOSE FOR THE TAPERED SHANK.

^aIndicates working surfaces.

All dimensions except degrees in millimeters

Figure F.5M—Male Cap Electrode Adaptor Shanks—Dimensional Specifications

Table F.2
Standard for Male Cap Electrode and Adapter Shank

Tapered Shank						Tolerance
E	Diameter	0.482	5/8	3/4		±0.002
F	Taper diameter	0.463	0.625	0.750		+0.000/−0.001
G	Length	As coded	As coded	As coded		±0.010
	Length, min	2.0	2.0	2.0		—
K	Hole diameter	0.28	0.38	0.44		±0.010
L	Land diameter	—	—	—		—
N	Taper diameter	0.313	0.414	0.500		+0.000/−0.001
Y	Taper location	0.50	0.75	0.88		±0.010
P	Taper depth, min	0.80	0.80	0.94		±0.010
Straight Shank						Tolerance
E	Diameter	1/2	5/8	3/4	7/8	±0.002
F	Taper diameter	—	—	—	—	—
G	Length	As coded	As coded	As coded	As coded	±0.010
	Length, min	2.0	2.0	2.0	2.25	—
K	Hole diameter	0.28	0.38	0.44	0.56	±0.010
L	Land diameter	0.33	0.44	0.56	0.62	±0.010
N	Taper diameter	0.313	0.414	0.500	0.700	+0.000/−0.001
Y	Taper location	—	—	—	—	—
P	Taper depth, min	0.80	0.80	0.94	0.94	±0.010

All dimensions in inches

Notes:

1. Ordering and material as per code shown in Figure F.4.
2. All working surfaces to have a maximum finish roughness of 30 μin (arithmetic average).
3. Stamp identification mark clearly—avoid working surfaces.
4. Chemically clean caps—use a procedure to minimize oxidation and to be noninsulating in nature.

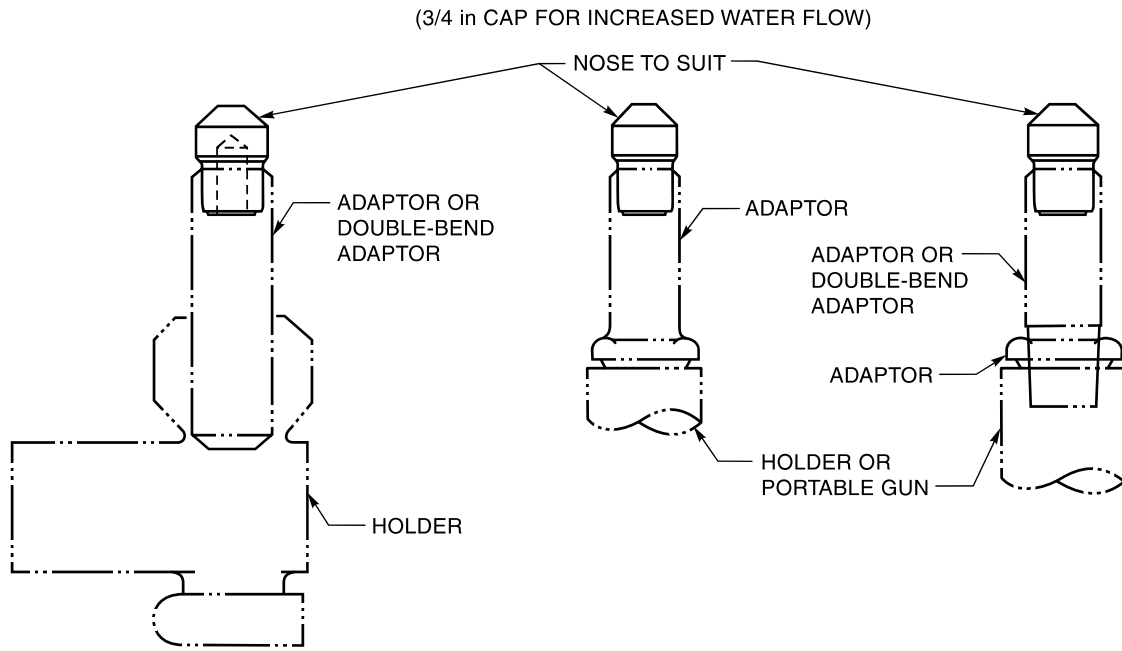
Table F.2M
Standard for Male Cap Electrode and Adapter Shank

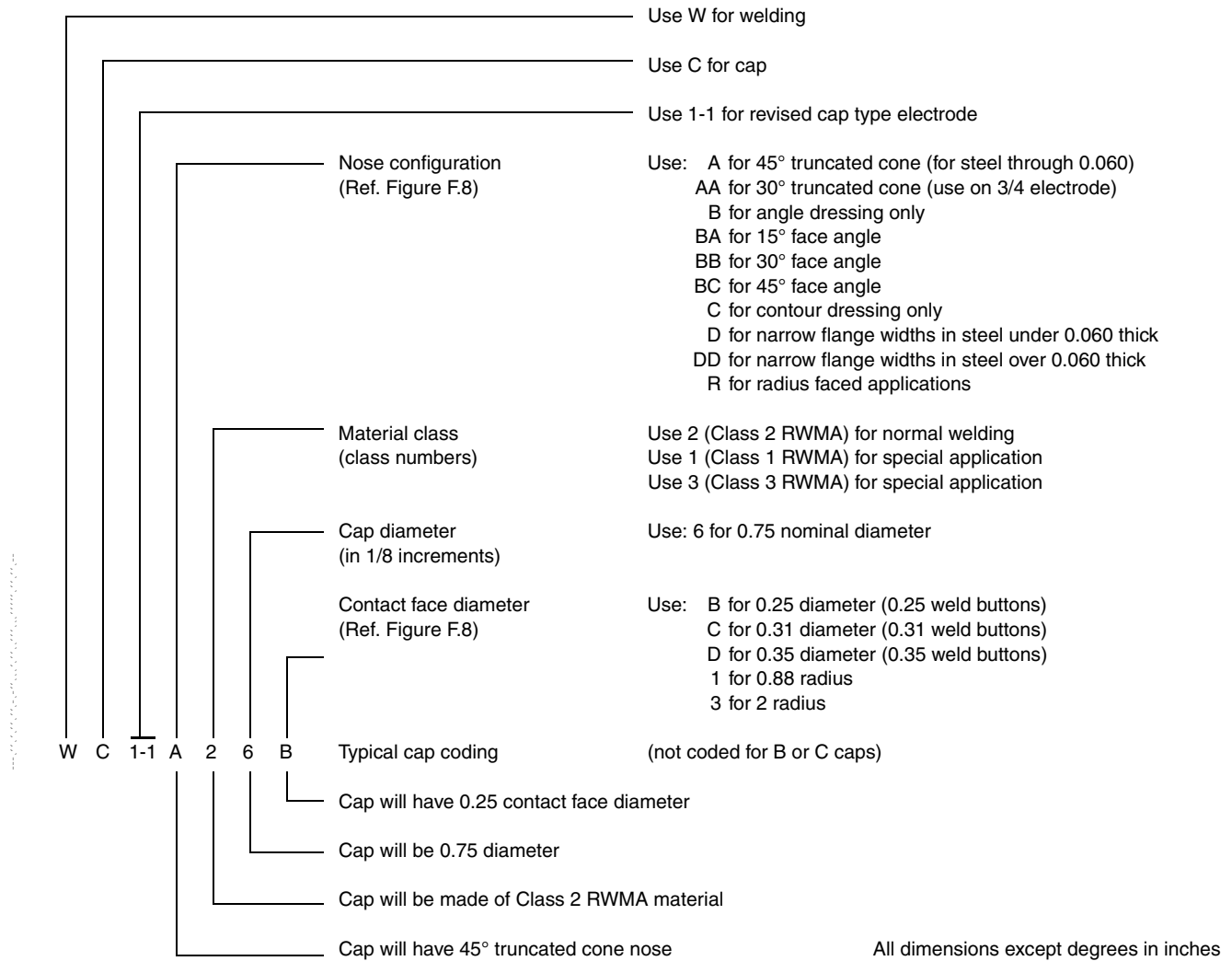
Tapered Shank						Tolerance
E	Diameter	12.2	16	19		±0.05
F	Taper diameter	11.8	15.9	19.0		+0.00/−0.03
G	Length	As coded	As coded	As coded		±0.25
	Length, min	51	51	51		—
K	Hole diameter	7.1	9.7	14.2		±0.25
L	Land diameter	—	—	—		—
N	Taper diameter	7.95	10.52	12.70		+0.03/−0.00
Y	Taper location	12.7	19.0	22.4		±0.25
P	Taper depth, min	20.3	20.3	23.9		±0.25
Straight Shank						Tolerance
E	Diameter	13	16	19	11	±0.05
F	Taper diameter	—	—	—	—	—
G	Length	As coded	As coded	As coded	As coded	±0.25
	Length, min	51	51	51	57	—
K	Hole diameter	7.1	9.7	11.2	14.2	±0.25
L	Land diameter	8.4	11.2	14.2	15.7	±0.25
N	Taper diameter	7.95	10.52	12.70	17.78	+0.03/−0.00
Y	Taper location	—	—	—	—	—
P	Taper depth, min	20.3	20.3	23.9	23.9	±0.25

All dimensions in inches

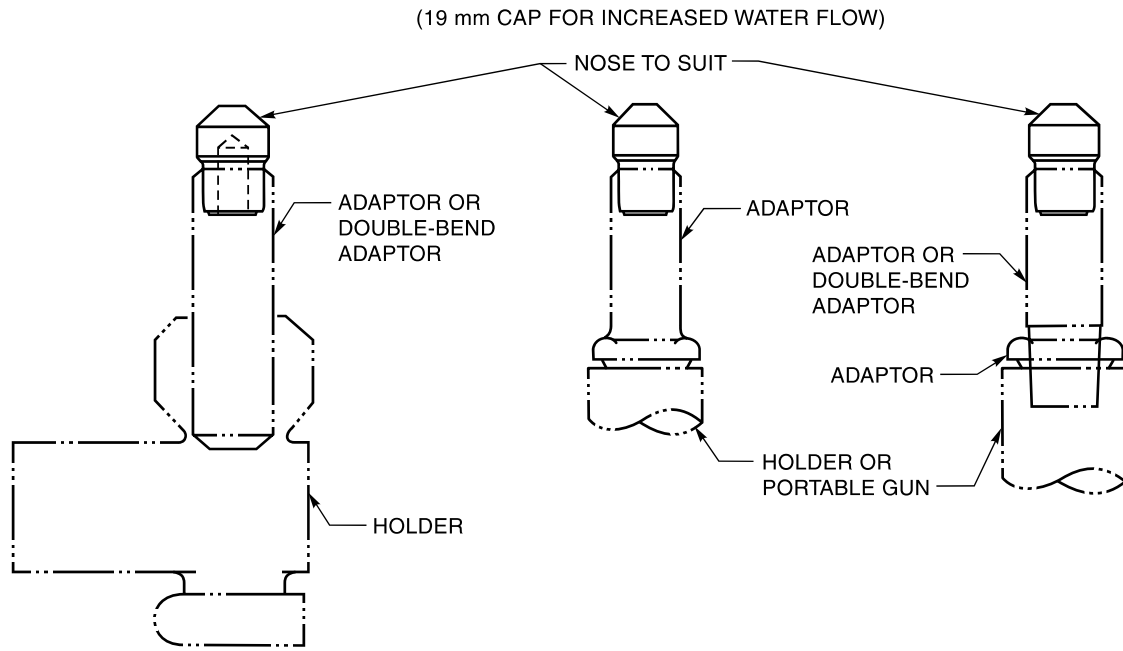
Notes:

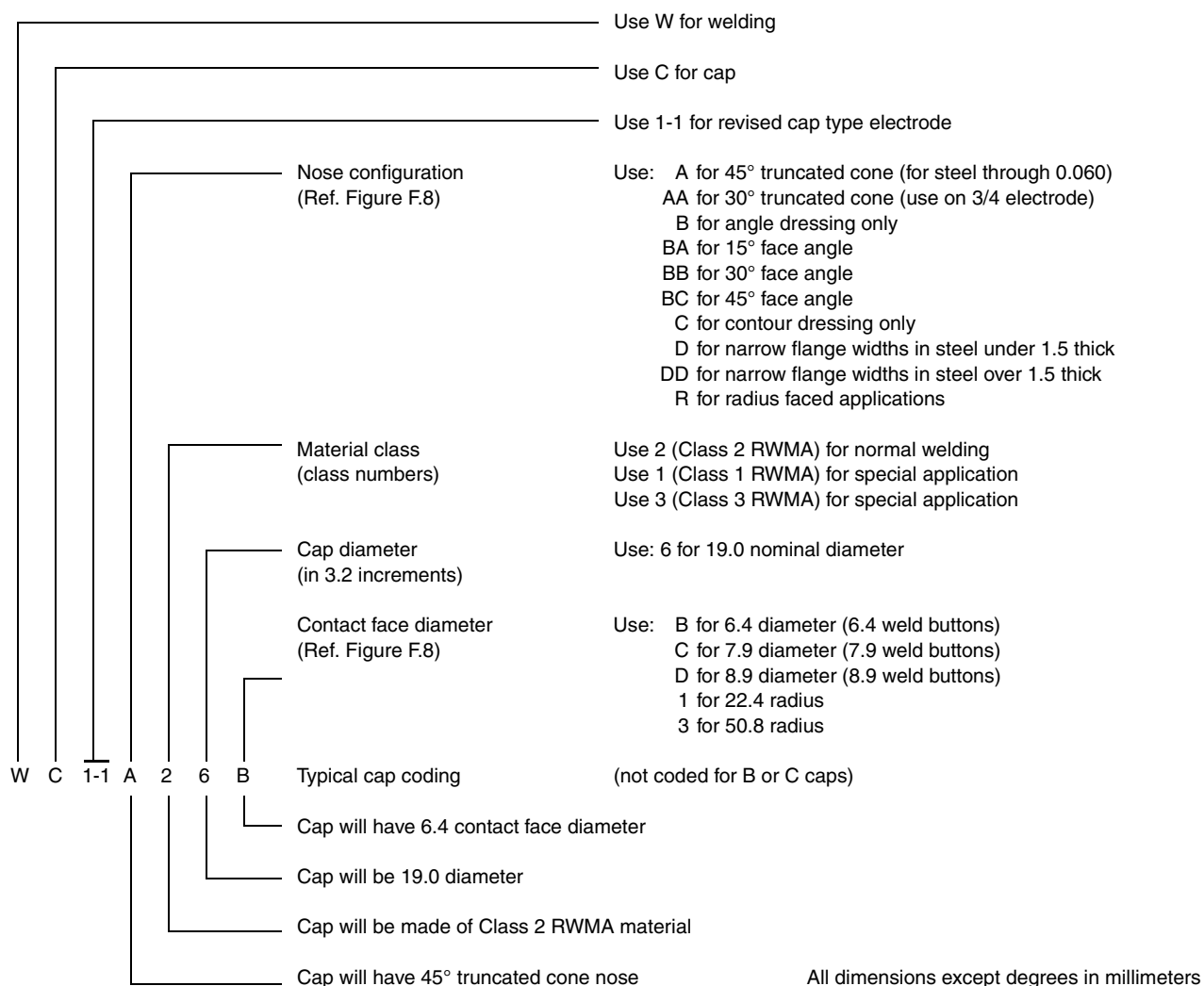
1. Ordering and material as per code shown in Figure F.4.
2. All working surfaces to have a maximum finish roughness of 0.75 μm (arithmetic average).
3. Stamp identification mark clearly—avoid working surfaces.
4. Chemically clean caps—use a procedure to minimize oxidation and to be noninsulating in nature.



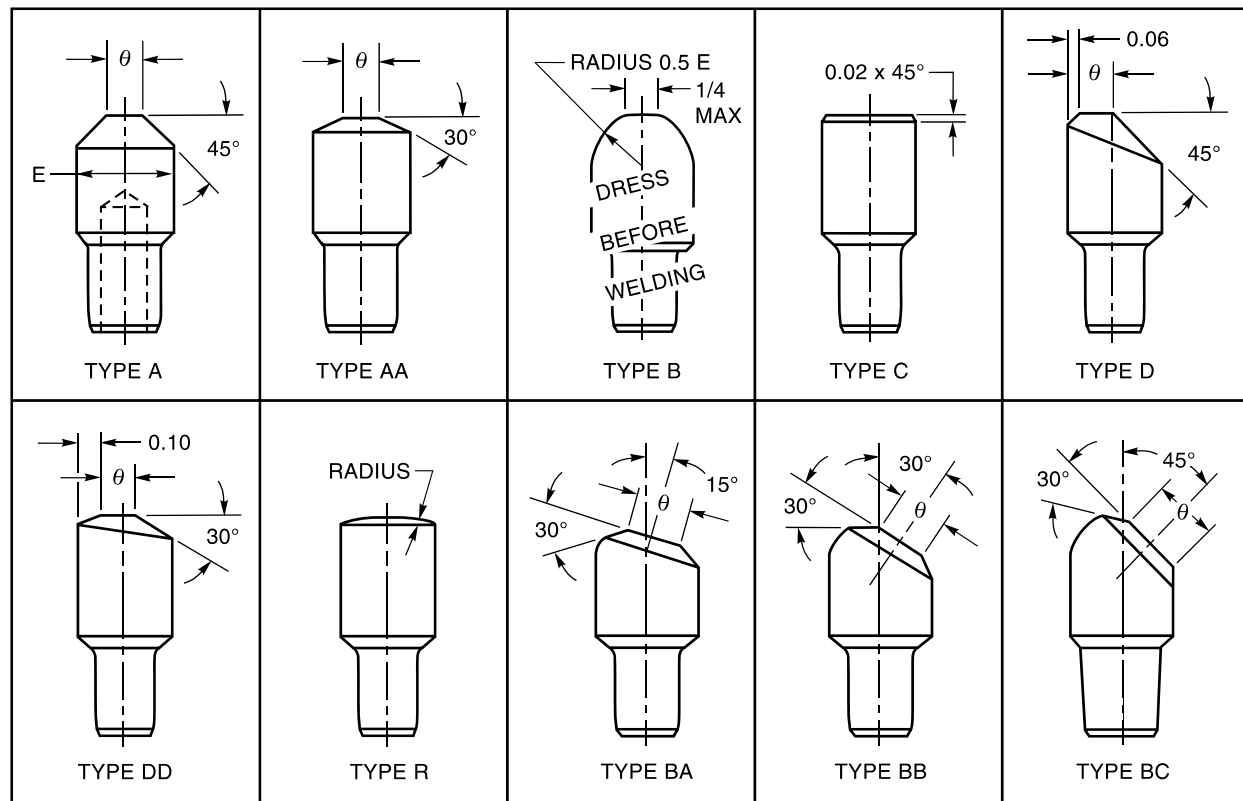


**Figure F.6—3/4 in Increased Water Flow
Male Cap Electrodes—Ordering Codes**





**Figure F.6M—19 mm Increased Water Flow
Male Cap Electrodes—Ordering Codes**



For nose application, see Figure F-6.

All dimensions except degrees in inches

Type		A	AA	B	BA	BB	BC	C	D	DD	R
E	Diameter	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
θ-Contact	B	0.25	0.25	Note b	0.25	0.25	0.25	Note b	0.25	0.25	0.88R
Face Diameter	C	Note a	0.31	Note b	0.31	0.31	0.31	Note b	0.31	0.31	or
or Radius ±0.005	D	Note a	0.35	Note b	0.35	0.35	0.35	Note b	Note a	0.35	2.0R

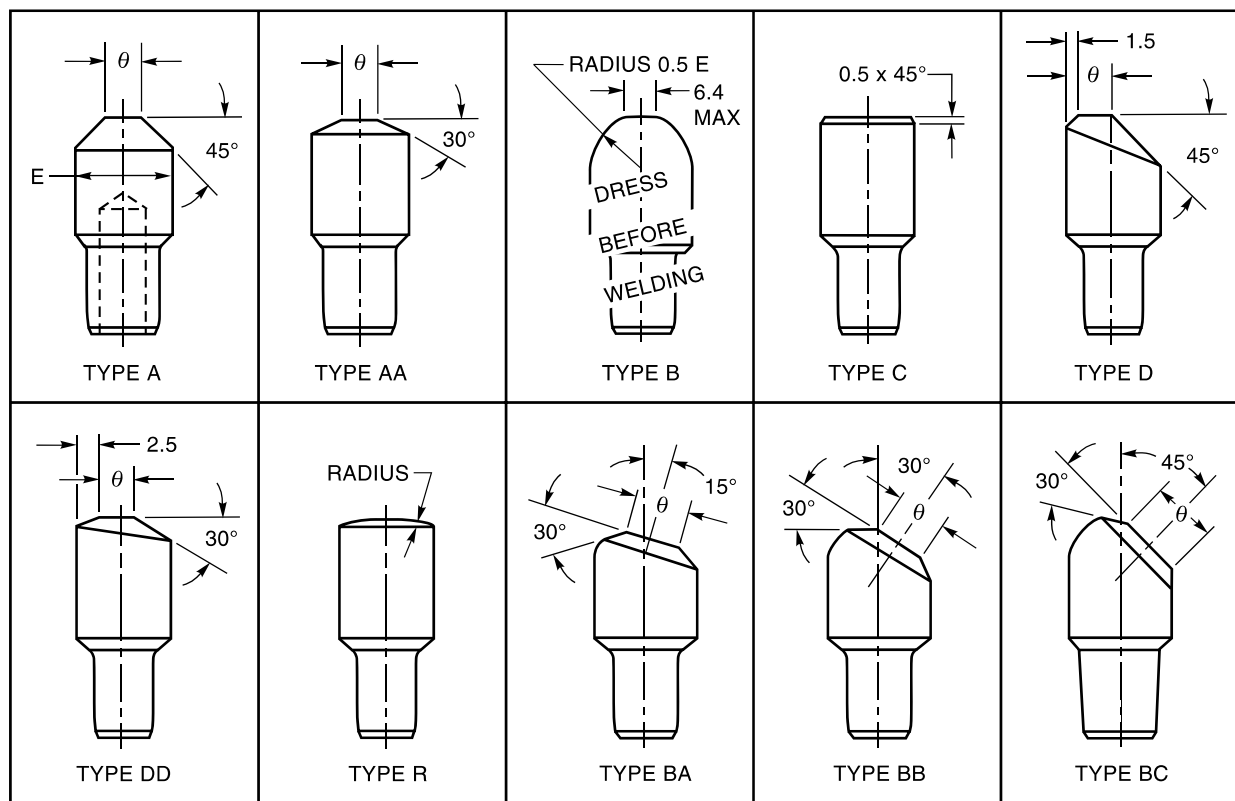
^a Not recommended.^b Dress to suit.

All dimensions in inches

Notes:

1. Ordering and material as per code shown in Figure F.6.
2. All working surfaces to have a maximum finish of 30 μin (arithmetic average).
3. Stamp identification mark clearly—avoid working surfaces.
4. Chemically clean adaptors—use a procedure to minimize oxidation and to be noninsulating in nature.
5. To be used with Figure F.5 electrode adaptors only.

Figure F.7—3/4 in Increased Water Flow Male Cap Electrodes—Nose Design



For nose application, see Figure F-6.

All dimensions except degrees in millimeters

Type		A	AA	B	BA	BB	BC	C	D	DD	R
E	Diameter	19	19	19	19	19	19	19	19	19	19
θ-Contact	B	6.4	6.4	Note b	6.4	6.4	6.4	Note b	6.4	6.4	0.88R
Face Diameter	C	Note a	7.9	Note b	7.9	7.9	7.9	Note b	7.9	7.9	or
or Radius ±0.005	D	Note a	8.9	Note b	8.9	8.9	8.9	Note b	Note a	8.9	2.0R

^a Not recommended.

^b Dress to suit.

All dimensions in millimeters

Notes:

1. Ordering and material as per code shown in Figure F.6.
2. All working surfaces to have a maximum finish of 0.75 μm (arithmetic average).
3. Stamp identification mark clearly—avoid working surfaces.
4. Chemically clean adaptors—use a procedure to minimize oxidation and to be noninsulating in nature.
5. To be used with Figure F.5 electrode adaptors only.

Figure F.7M—19 mm Increased Water Flow Male Cap Electrodes—Nose Design

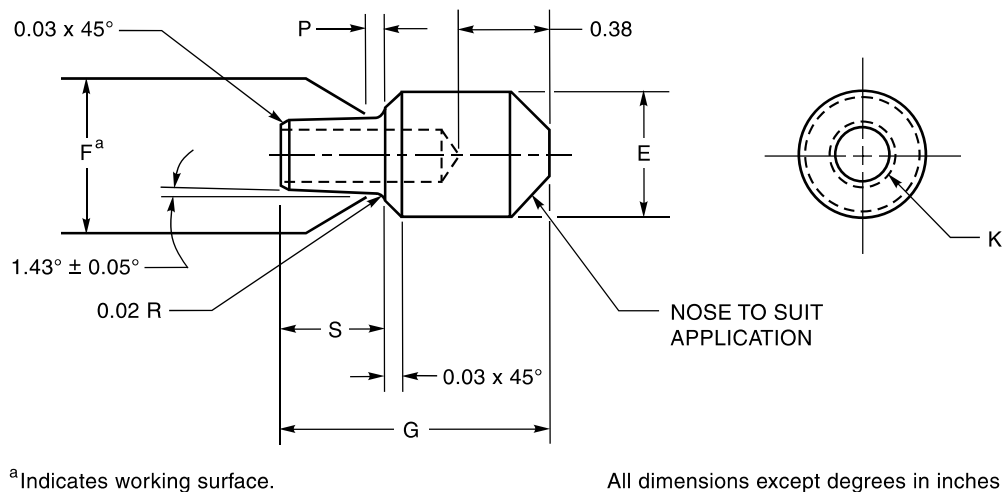


Figure F.8—3/4 in Increased Water Flow Male Cap Electrodes—Dimensions

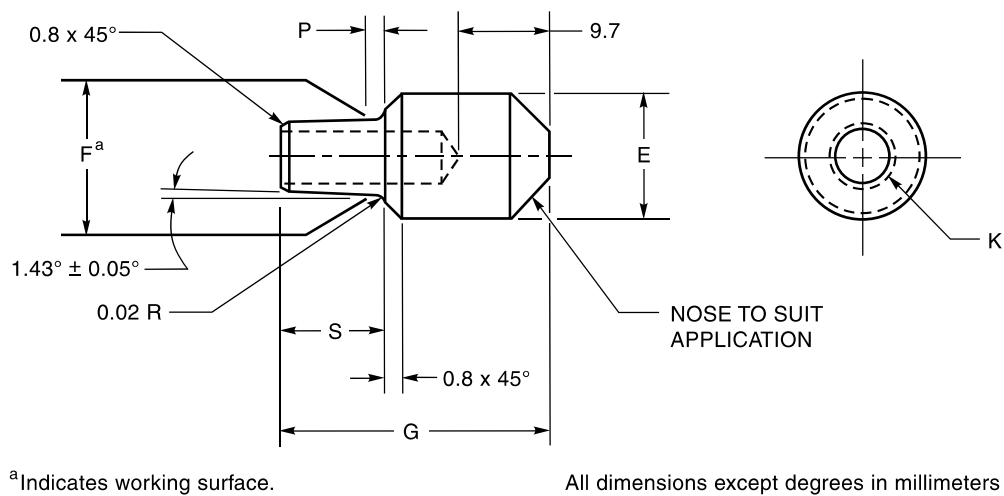


Figure F.8M—19 mm Increased Water Flow Male Cap Electrodes—Dimensions

Table F.3
Standard for Increased Water Flow Male Cap Electrodes

				Tolerance
E	Diameter	3/4		±0.002
F	Taper diameter	0.564		+0.000/−0.001
G	Length	1.26		±0.010
K	Hole diameter	0.44		±0.010
P	Taper location	0.09		±0.010
S	Skirt length	0.62		±0.010

Notes:

All dimensions in inches

1. Ordering and material as per code shown in Figure F.6.
2. All working surfaces to have a maximum finish of 30 μ in (arithmetic average).
3. Stamp identification mark clearly—avoid working surfaces.
4. Chemically clean caps—use a procedure to minimize oxidation and to be noninsulating in nature.
5. To be used with Figure F.5 electrode adaptors only.

Table F.3M
Standard for Increased Water Flow Male Cap Electrodes

				Tolerance
E	Diameter	19		±0.05
F	Taper diameter	14.3		+0.00/−0.03
G	Length	32.0		±0.25
K	Hole diameter	11.2		±0.25
P	Taper location	2.3		±0.25
S	Skirt length	15.7		±0.25

Notes:

All dimensions in millimeters

1. Ordering and material as per code shown in Figure F.6.
2. All working surfaces to have a maximum finish of 0.75 μ m (arithmetic average).
3. Stamp identification mark clearly—avoid working surfaces.
4. Chemically clean caps—use a procedure to minimize oxidation and to be noninsulating in nature.
5. To be used with Figure F.5 electrode adaptors only.

TYPE "F" FEMALE ELECTRODE CAPS

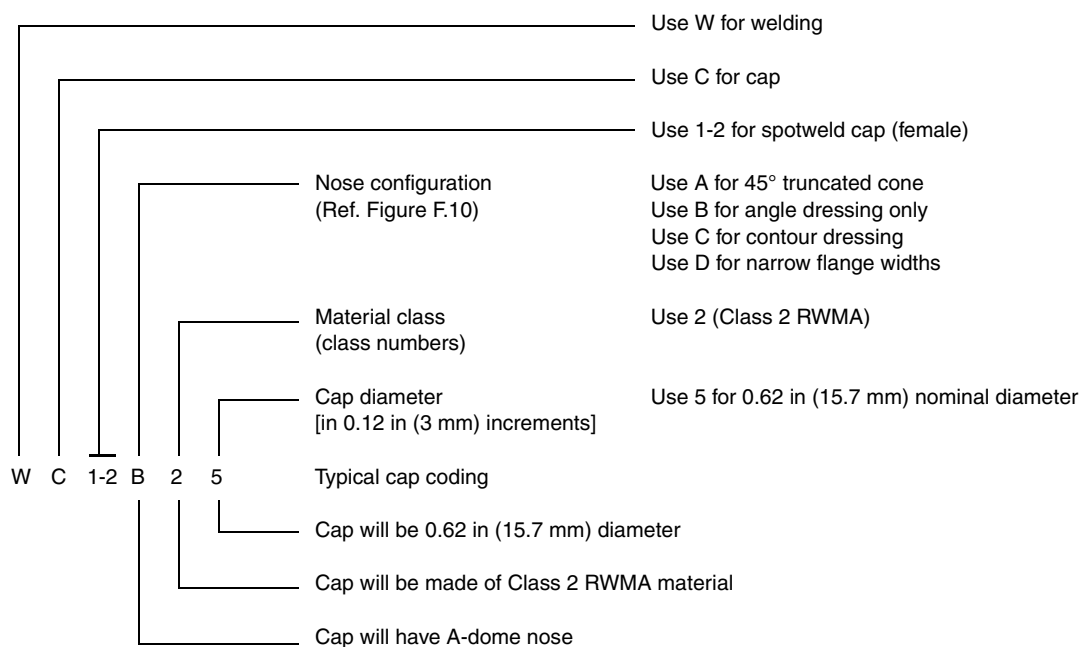
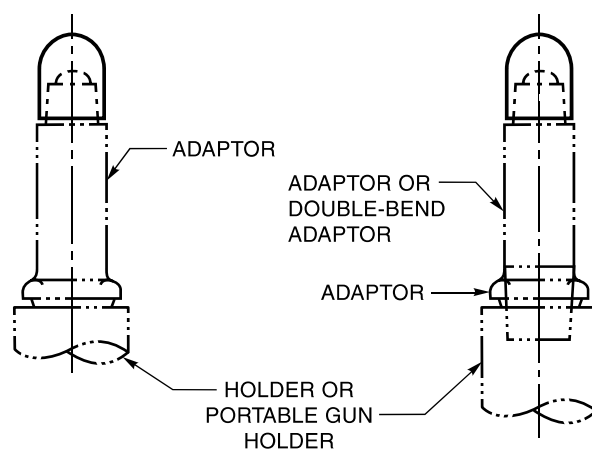
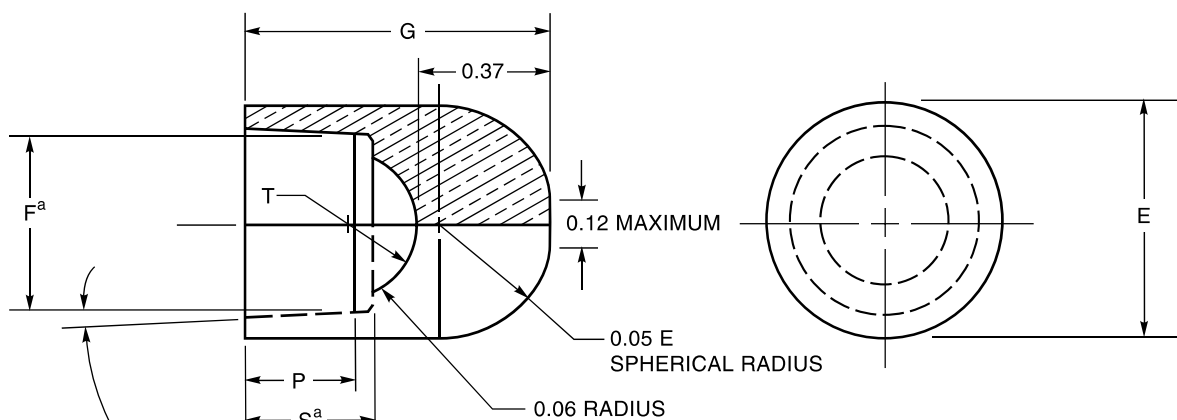
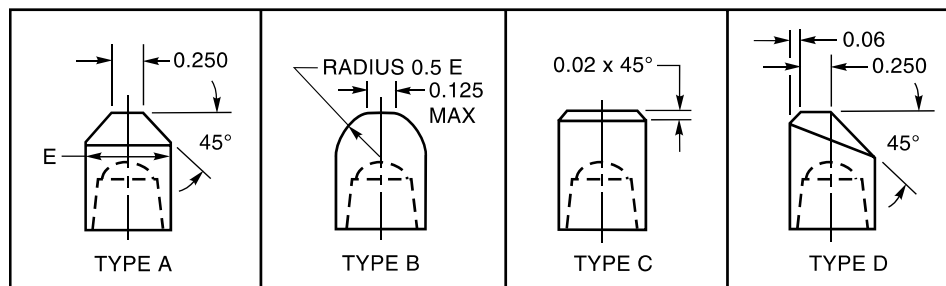


Figure F.9—Type "F" Female Cap Electrodes—Ordering Codes



ANY SURFACE IRREGULARITIES, WAVINESS, DISH, OR CHAMFER MUST REMAIN WITHIN THE TOLERANCES SHOWN

TAPER PER SIDE SHALL BE ROUND WITHIN 0.0003 T.I.R.
AND CONCENTRIC WITHIN 0.010 T.I.R.

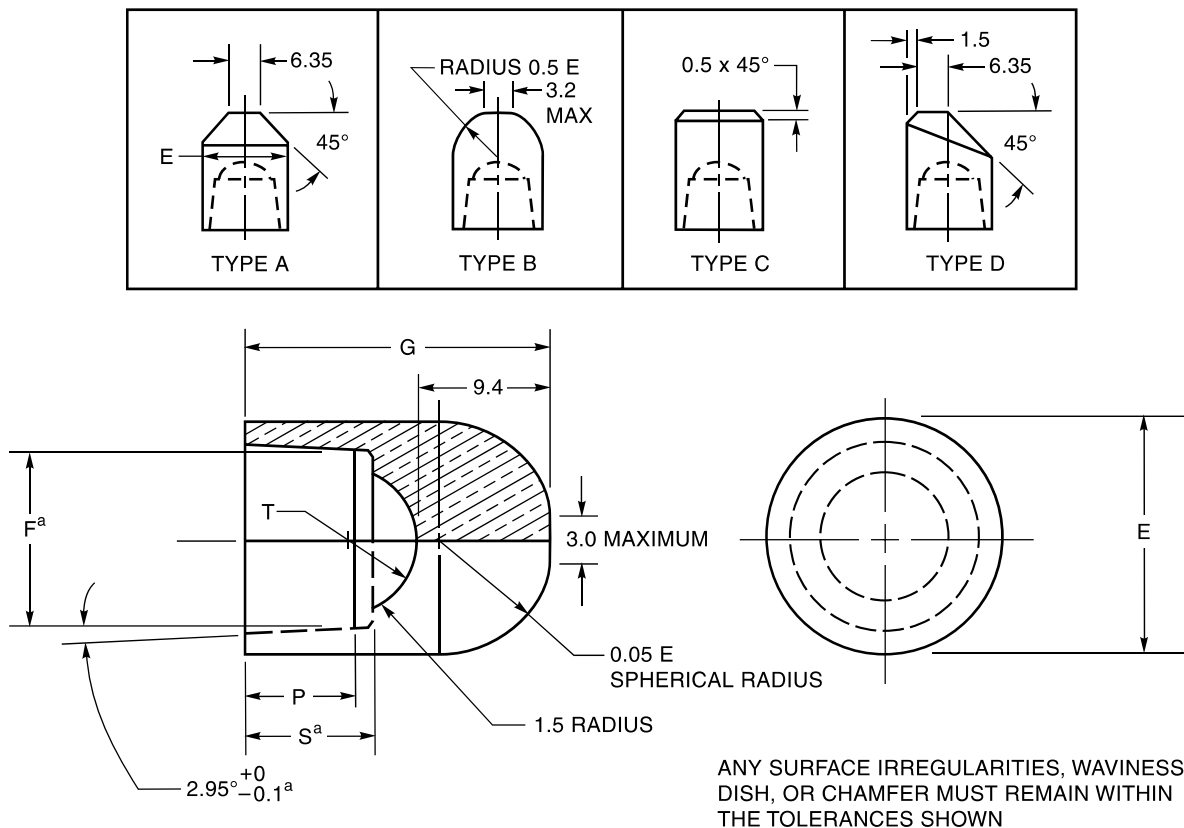
^aIndicates working surfaces.

All dimensions except degrees in inches

Notes:

1. For manufacture by cold forming only.
2. Use RWMA Class 2 (M-1566-B) in annealed condition—After forming, age-harden for 5 hours at a temperature to produce a minimum hardness of R_B 77 measured within 0.12 of center line and 0.03 below surface of cap.
3. Flat on welding face must be provided to give weld button sizes specified without exceeding weld indentation limitations.

Figure F.10—Type “F” Female Cap Electrodes—Description



TAPER PER SIDE SHALL BE ROUND WITHIN 0.008 T.I.R.
AND CONCENTRIC WITHIN 0.25 T.I.R.

^aIndicates working surfaces.

All dimensions except degrees in millimeters

Notes:

1. For manufacture by cold forming only.
2. Use RWMA Class 2 (M-1566-B) in annealed condition—After forming, age-harden for 5 hours at a temperature to produce a minimum hardness of R_B 77 measured within 0.12 of center line and 0.03 below surface of cap.
3. Flat on welding face must be provided to give weld button sizes specified without exceeding weld indentation limitations.

Figure F.10M—Type “F” Female Cap Electrodes—Description

Table F.4
Standard for Female Cap Electrodes

				Tolerance
E	Diameter	0.625		± 0.002
F	Taper diameter	0.458		$+0.000/-0.001$
G	Length	0.850		± 0.010
P	Taper location	0.354		± 0.010
S	Taper depth	0.362		± 0.010
T	Spherical radius	0.165		± 0.010

Notes:

All dimensions in millimeters

1. Ordering and material as per code shown in Figure F.9.
2. All working surfaces to have a maximum finish roughness of 30 μin (arithmetic average).
3. Stamp identification mark clearly—avoid working surfaces.
4. Chemically clean caps—use a procedure to minimize oxidation and to be noninsulating in nature.

Table F.4M
Standard for Female Cap Electrodes

				Tolerance
E	Diameter	15.9		± 0.05
F	Taper diameter	11.6		$+0.03/-0.00$
G	Length	21.6		± 0.25
P	Taper location	9.00		± 0.25
S	Taper depth	9.20		± 0.25
T	Spherical radius	4.20		± 0.25

Notes:

All dimensions in millimeters

1. Ordering and material as per code shown in Figure F.9.
2. All working surfaces to have a maximum finish roughness of 30 μin (arithmetic average).
3. Stamp identification mark clearly—avoid working surfaces.
4. Chemically clean caps—use a procedure to minimize oxidation and to be noninsulating in nature.

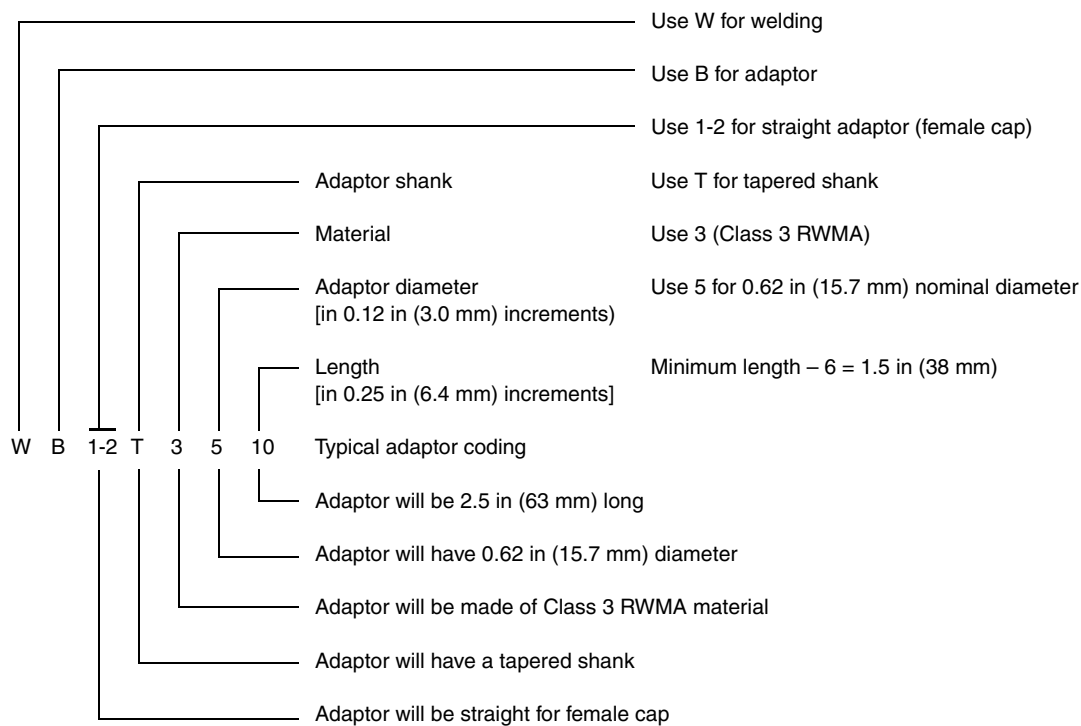
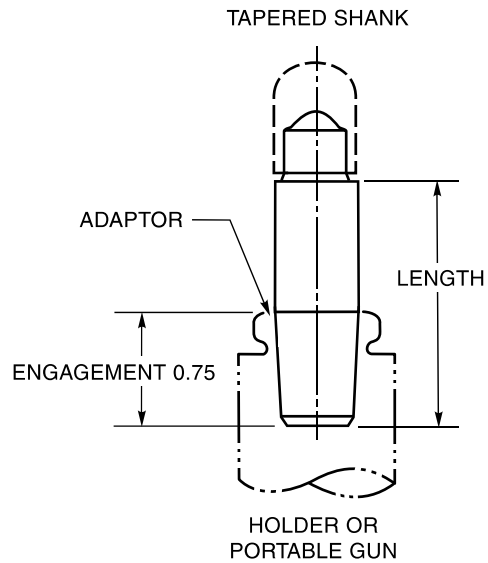
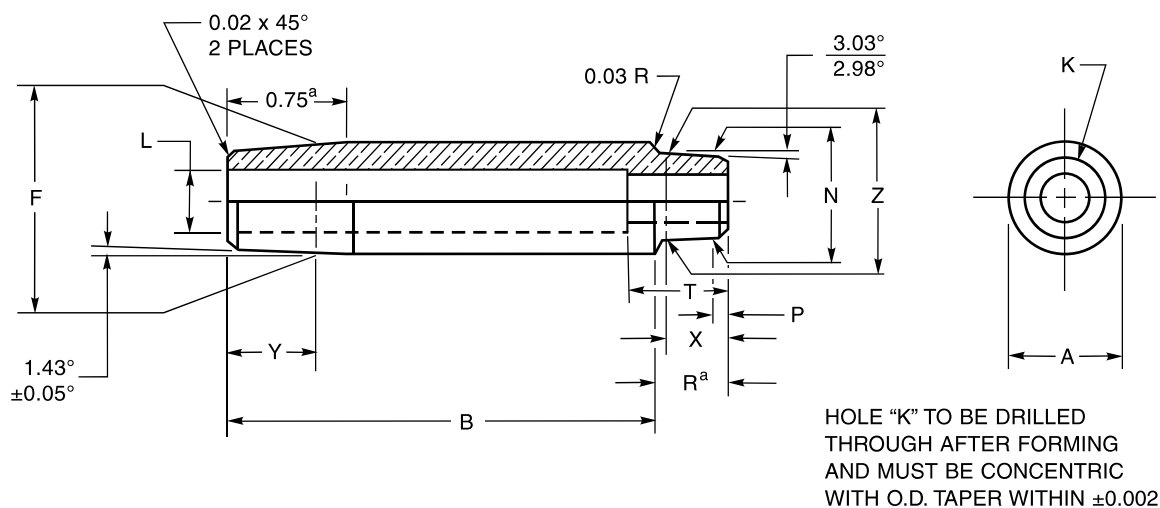


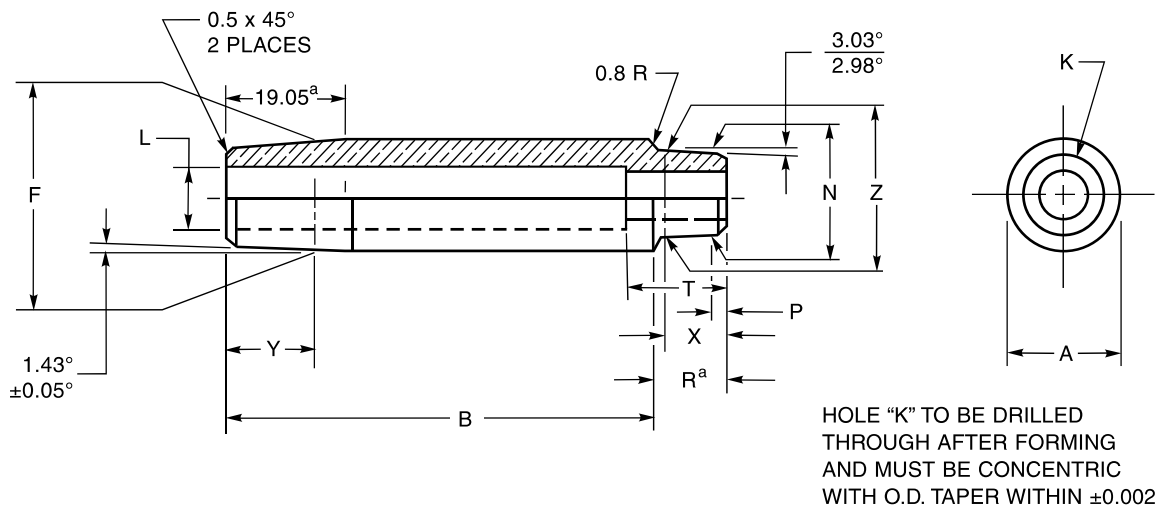
Figure F.11—Straight Adaptor for Type “F” Female Cap Electrodes—Ordering Codes



^aIndicates working surfaces.

All dimensions except degrees in inches

Figure F.12—Straight Adaptor for Type "F" Female Cap Electrodes—Description



^aIndicates working surfaces.

All dimensions except degrees in millimeters

Figure F.12M—Straight Adaptor for Type "F" Female Cap Electrodes—Description

Table F.5
Standard for Straight Adaptors for Type “F” Female Cap Electrodes

				Tolerance
A	Diameter	0.625		±0.002
F	Taper diameter	0.625		+0.000/–0.001
Y	Taper location	0.75		±0.010
B	Length	As coded		±0.010
	Length, minimum	1.5		—
K	Hole diameter	0.312		±0.002
L	Hole diameter	0.37		±0.010
N	Taper diameter cap end	0.472		+0.001/–0.000
P	Tape location cap end	0.10		±0.010
R	Taper length	0.50		±0.010
T	Hole “K” length	0.62		±0.010
Z	Taper diameter	0.501		Ref.
X	Taper locations	0.380		+0.000/–0.001
	Electrode Cap	Figure 20		—

Notes:

All dimensions in inches

1. Ordering and material as per code shown in Figure F.11.
2. All working surfaces to have a maximum finish roughness of 30 µin (arithmetic average).
3. Stamp identification mark clearly—avoid working surfaces.
4. Chemically clean caps—use a procedure to minimize oxidation and to be noninsulating in nature.

Table F.5M
Standard for Straight Adaptors for Type “F” Female Cap Electrodes

				Tolerance
A	Diameter	15.9		±0.05
F	Taper diameter	15.9		+0.000/–0.03
Y	Taper location	19.0		±0.25
B	Length	As coded		±0.25
	Length, minimum	38		—
K	Hole diameter	7.92		±0.05
L	Hole diameter	9.4		±0.25
N	Taper diameter cap end	11.99		+0.002/–0.000
P	Tape location cap end	2.5		±0.25
R	Taper length	12.7		±0.25
T	Hole “K” length	15.8		±0.25
Z	Taper diameter	12.7		Ref.
X	Taper locations	9.65		+0.00/–0.25
	Electrode Cap	Figure 20		—

Notes:

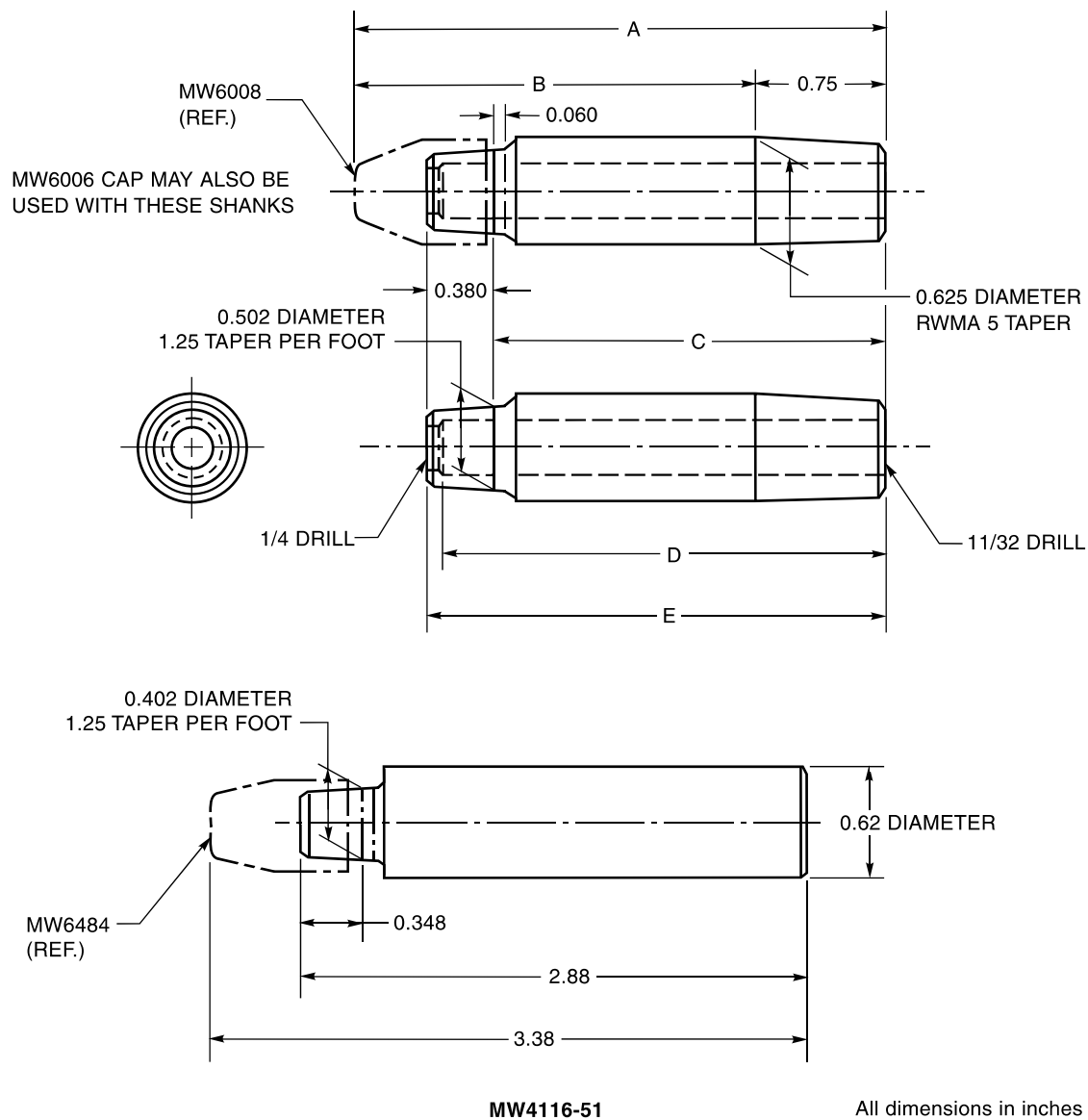
All dimensions in millimeters

1. Ordering and material as per code shown in Figure F.11.
2. All working surfaces to have a maximum finish roughness of 0.75 µm (arithmetic average).
3. Stamp identification mark clearly—avoid working surfaces.
4. Chemically clean caps—use a procedure to minimize oxidation and to be noninsulating in nature.

Annex G (Informative)

Female Cap Electrodes and Adaptor Conventions in Common Usage by Automotive Companies

This annex is not a part of AWS D8.6:2005, *Specification for Automotive Resistance Spot Welding Electrodes*, but is included for informational purposes only.



**Figure G.1—Nomenclature for Straight Adaptors and Assemblies
for Female Cap Electrodes with RWMA #5 Taper**

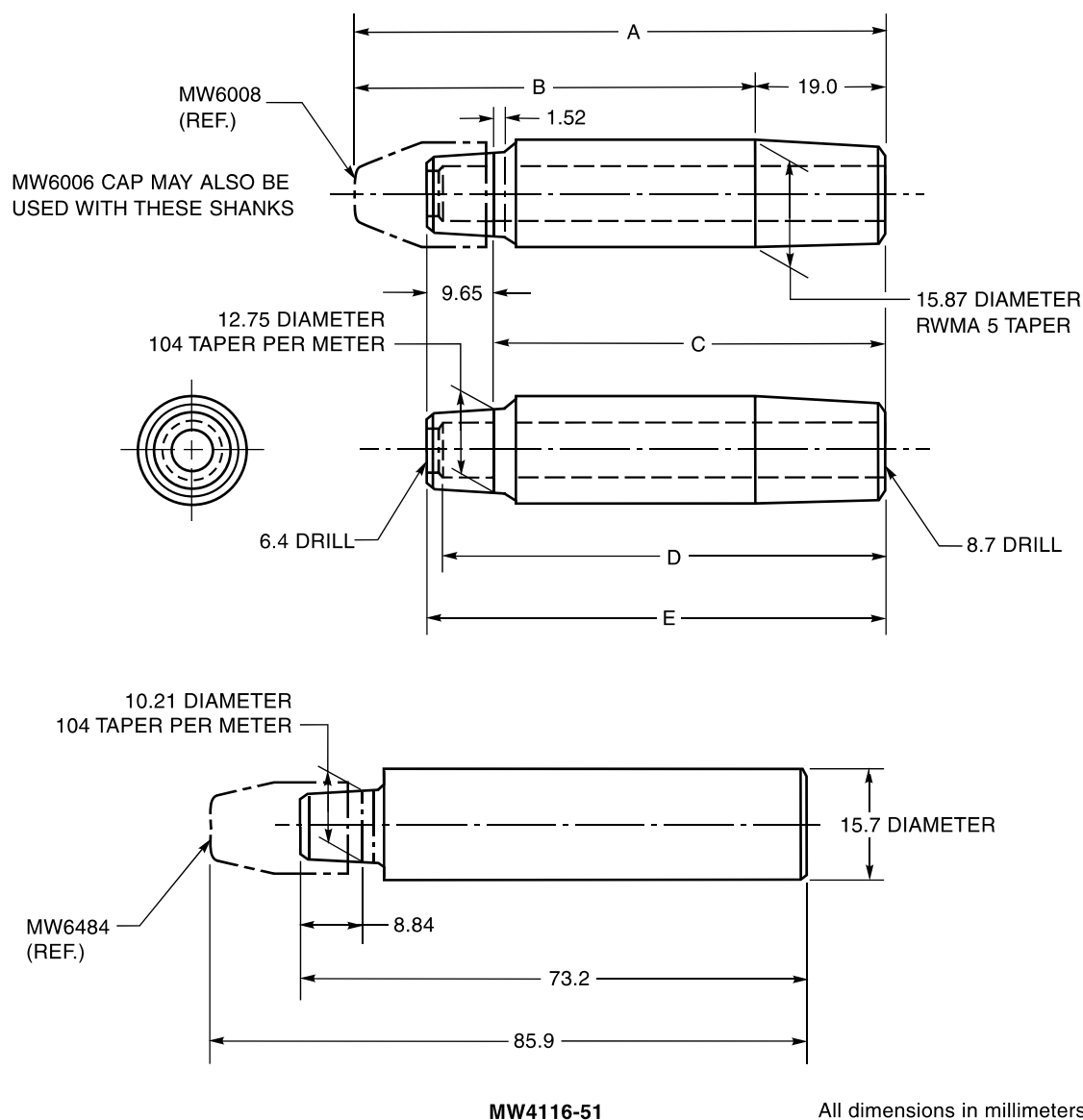


Figure G.1M—Nomenclature for Straight Adaptors and Assemblies for Female Cap Electrodes with RWMA #5 Taper

Table G.1
Standard for Straight Adaptor for Female Cap Electrodes

A	B	C	D	E	Shank (Less Cap)	When Assembled with MW6008 Cap is Equivalent to
1.75	1.00	0.83	1.09	1.21	MW631-51	RWMA-A227
2.00	1.25	1.08	1.34	1.46	MW631-52	RWMA-A228
2.25	1.50	1.33	1.59	1.71	MW631-53	RWMA-A229
2.50	1.75	1.58	1.84	1.96	MW631-54	RWMA-A2210
2.75	2.00	1.83	2.09	2.21	MW631-55	RWMA-A2211
3.00	2.25	2.08	2.34	2.46	MW631-56	RWMA-A2212
3.25	2.50	2.33	2.59	2.71	MW631-57	RWMA-A2213
3.50	2.75	2.58	2.84	2.96	MW631-58	RWMA-A2214
3.75	3.00	2.83	3.09	3.21	MW631-59	RWMA-A2215
4.00	3.25	3.08	3.34	3.46	MW631-60	RWMA-A2216
4.25	3.50	3.33	3.59	3.71	MW631-61	RWMA-A2217
4.50	3.75	3.58	3.84	3.96	MW631-62	MW407-14A
4.75	4.00	3.83	4.09	4.21	MW631-63	MW407-15A
5.00	4.25	4.08	4.34	4.46	MW631-64	—
5.25	4.50	4.33	4.59	4.71	MW631-65	—
5.50	4.75	4.58	4.84	4.96	MW631-66	—
5.75	5.00	4.83	5.09	5.21	MW631-67	—
6.00	5.25	5.08	5.34	5.46	MW631-68	—
6.25	5.50	5.33	5.59	5.71	MW631-69	—
6.50	5.75	5.58	5.84	5.96	MW631-70	—

All dimensions in inches

Table G.1M
Standard for Straight Adaptor for Female Cap Electrodes

A	B	C	D	E	Shank (Less Cap)	When Assembled with MW6008 Cap is Equivalent to
44.4	25.4	21.1	27.7	30.7	MW631-51	RWMA-A227
50.8	31.7	27.4	34.1	37.1	MW631-52	RWMA-A228
57.1	38.1	33.8	40.4	43.4	MW631-53	RWMA-A229
63.5	44.4	40.1	46.8	49.8	MW631-54	RWMA-A2210
70.0	50.8	46.5	53.1	56.1	MW631-55	RWMA-A2211
76.2	57.1	52.8	59.5	62.5	MW631-56	RWMA-A2212
82.5	63.5	59.2	65.8	68.8	MW631-57	RWMA-A2213
88.9	70.0	65.5	72.2	75.2	MW631-58	RWMA-A2214
95.3	76.2	71.9	78.5	81.5	MW631-59	RWMA-A2215
101.6	82.5	78.2	84.8	87.9	MW631-60	RWMA-A2216
107.9	88.9	84.5	91.2	94.2	MW631-61	RWMA-A2217
114.3	95.3	90.9	97.6	100.6	MW631-62	MW407-14A
120.6	101.6	97.3	103.9	106.9	MW631-63	MW407-15A
127.0	107.9	103.6	110.3	113.3	MW631-64	—
133.3	114.3	110.0	116.6	119.6	MW631-65	—
139.7	120.6	116.3	123.0	126.0	MW631-66	—
146.0	127.0	122.7	129.3	132.3	MW631-67	—
152.4	133.3	129.0	135.7	138.7	MW631-68	—
158.7	139.7	135.4	141.7	145.0	MW631-69	—
165.1	146.0	141.7	148.3	151.4	MW631-70	—

All dimensions in millimeters

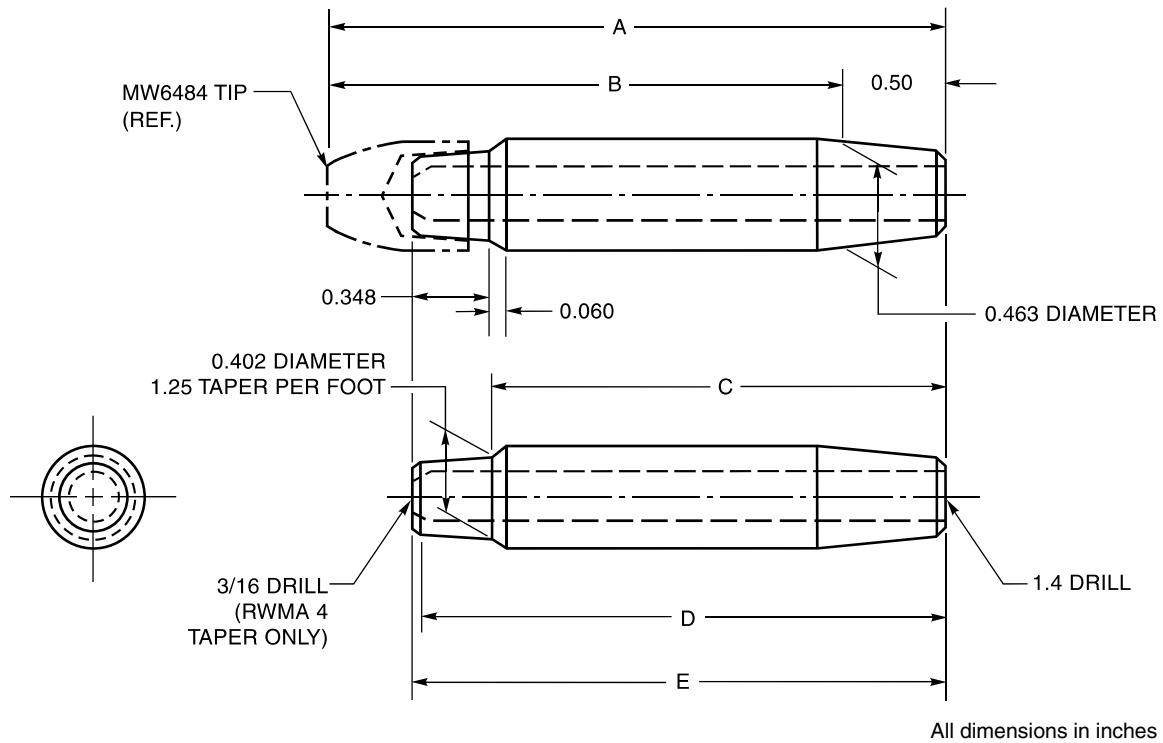


Figure G.2—Nomenclature for Straight Adaptors and Assemblies for Female Cap Electrodes with RWMA #4 and #1 Special Tapers

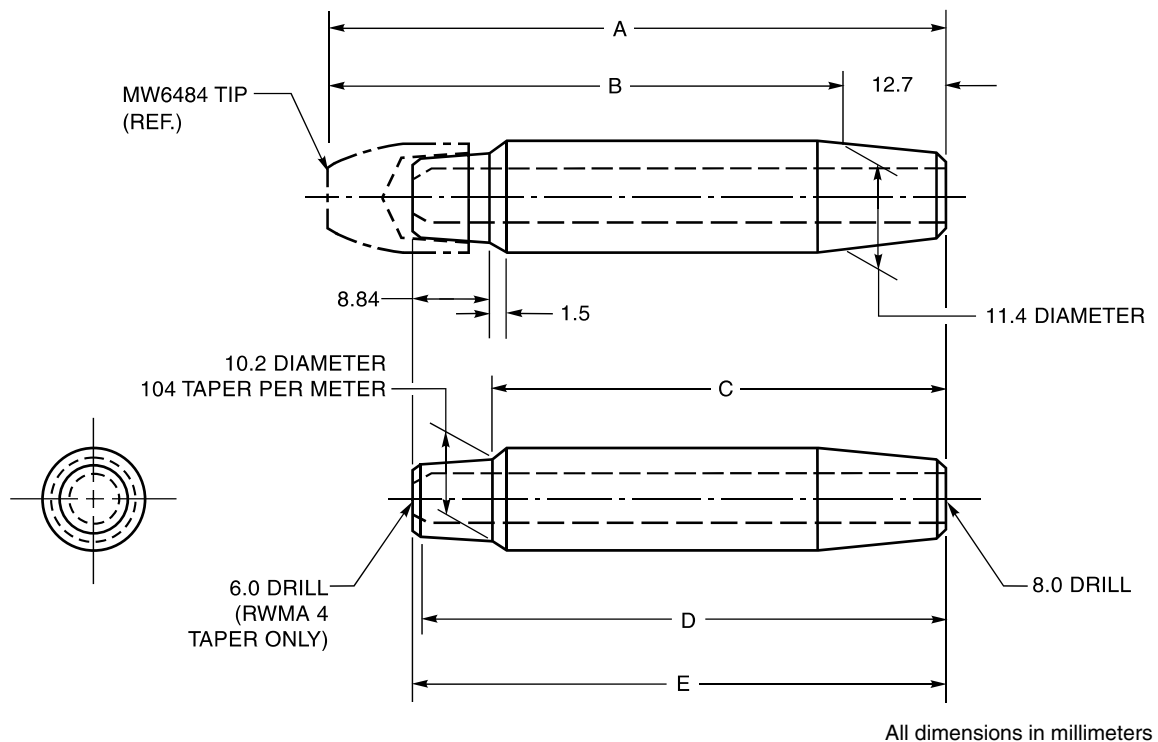


Figure G.2M—Nomenclature for Straight Adaptors and Assemblies for Female Cap Electrodes with RWMA #4 Cap and RWMA #4 Tapers

Table G.2
Standard for Straight Adaptors for RWMA #4 Female Cap Electrodes and #1 Special Tapers

A	B	C	D	E	RWMA #4 Tapered Shank		#1 Special ^a Tapered Shank	
					RWMA #4 Tapered Shank (Less Cap)	When Assembled with MW5484 Cap is Equivalent to	#1 Special Tapered Shank (Less Cap)	When Assembled with MW6483 Cap is Equivalent to
1.50	1.00	0.65	0.94	1.00	MW645-51	RWMA-A216	MW6021-51	MW6346-2B
1.75	1.25	0.90	1.19	1.25	MW645-52	RWMA-A217	—	—
2.00	1.50	1.14	1.44	1.50	MW645-53	RWMA-A218	MW6021-53	MW6346-4B
2.25	1.75	1.40	1.69	1.75	MW645-54	RWMA-A219	—	—
2.50	2.00	1.65	1.94	2.00	MW645-55	RWMA-A2110	MW6021-55	MW6346-6B
2.75	2.25	1.90	2.19	2.25	MW645-56	RWMA-A2111	—	—
3.00	2.50	2.14	2.44	2.50	MW645-57	—	MW6021-57	MW6346-8B
3.25	2.75	2.40	2.69	2.75	MW645-58	RWMA-A2113	—	—
3.50	3.00	2.65	2.94	3.00	MW645-59	RWMA-A2114	MW6021-59	—
4.00	3.50	3.15	3.50	3.50	MW645-61	—	—	—
5.00	4.44	4.15	4.44	4.50	MW645-63	—	—	—

^aApproximately 6° taper.

All dimensions in inches

Table G.2M
Standard for Straight Adaptors for RWMA #4 Female Cap Electrodes and #1 Special Tapers

A	B	C	D	E	RWMA #4 Tapered Shank		#1 Special ^a Tapered Shank	
					RWMA #4 Tapered Shank (Less Cap)	When Assembled with MW5484 Cap is Equivalent to	#1 Special Tapered Shank (Less Cap)	When Assembled with MW6483 Cap is Equivalent to
38.1	35.4	16.5	23.9	25.4	MW645-51	RWMA-A216	MW6021-51	MW6346-2B
44.4	31.7	22.9	30.2	31.7	MW645-52	RWMA-A217	—	—
50.8	38.1	29.2	36.6	38.1	MW645-53	RWMA-A218	MW6021-53	MW6346-4B
57.1	44.4	35.6	42.9	44.4	MW645-54	RWMA-A219	—	—
63.5	50.8	41.9	49.3	50.8	MW645-55	RWMA-A2110	MW6021-55	MW6346-6B
70.0	57.1	48.3	55.6	57.1	MW645-56	RWMA-A2111	—	—
76.2	63.5	54.6	62.0	63.5	MW645-57	—	MW6021-57	MW6346-8B
82.5	70.0	61.0	68.3	70.0	MW645-58	RWMA-A2113	—	—
88.9	76.2	67.3	74.7	76.2	MW645-59	RWMA-A2114	MW6021-59	—
101.6	88.9	80.0	88.9	88.9	MW645-61	—	—	—
127.0	112.8	130.8	112.8	114.3	MW645-63	—	—	—

^aApproximately 6° taper.

All dimensions in millimeters

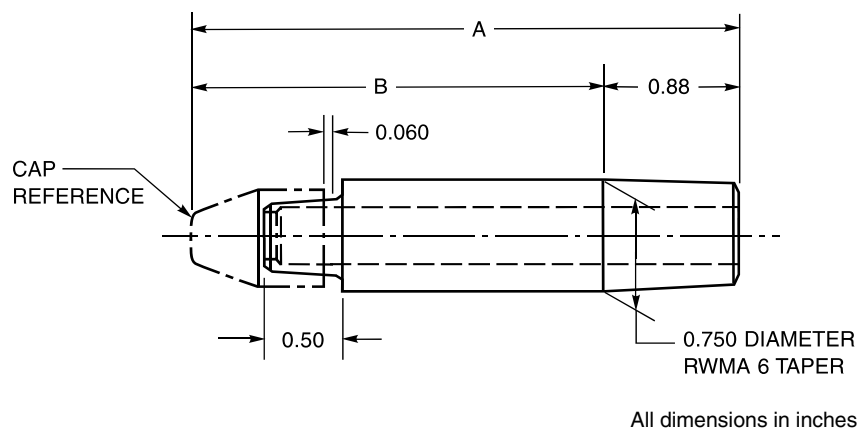


Figure G.3—Nomenclature for Straight Adaptors and Caps for Female Cap Electrodes with RWMA #6 Taper

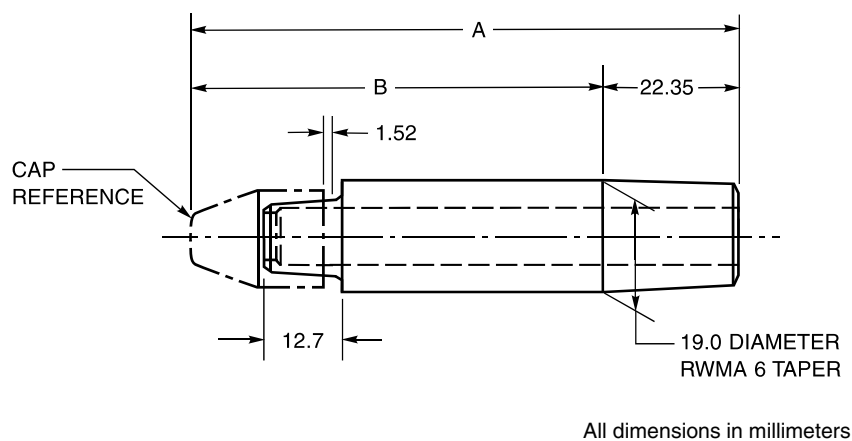


Figure G.3M—Nomenclature for Straight Adaptors and Caps for Female Cap Electrodes with RWMA #6 Taper

Table G.3
Standard for Straight Adaptors for RWMA #6 Female Cap Electrodes

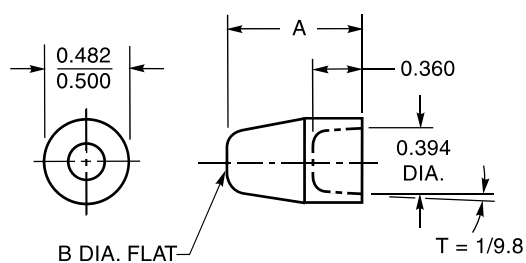
A	B	Cap	Code No.
2.38	1.50	MW6008	MW983-53
2.38	1.50	MW6146	MW1121-53
2.88	2.00	MW6146	MW1121-55
2.88	2.00	MW6008	MW983-55
3.38	2.50	MW6146	MW1121-57
3.38	2.50	MW6008	MW983-57
3.63	2.75	MW6146	MW1121-58
3.88	3.00	MW6146	MW1121-59
3.88	3.00	MW6008	MW983-59
4.13	3.25	MW6146	MW1121-60
4.38	3.50	MW6008	MW983-61
4.38	3.50	MW6146	MW1121-61
4.63	3.75	MW6146	MW1121-62
4.88	4.00	MW6008	MW983-63
4.88	4.00	MW6146	MW1121-63
5.38	4.50	MW6008	MW983-65
5.88	4.50	MW6146	MW1121-65
5.88	5.00	MW6008	MW983-67
5.88	5.00	MW6146	MW1121-67
6.38	5.50	MW6008	MW983-69
6.38	5.50	MW6146	MW1121-69

All dimensions in inches

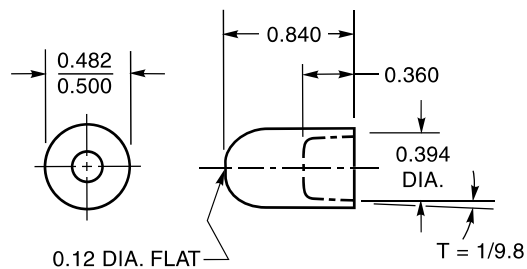
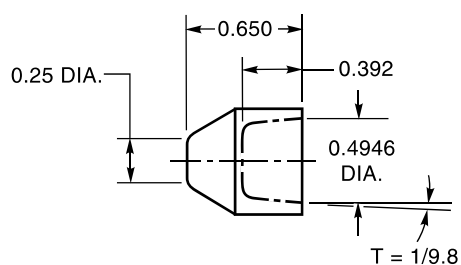
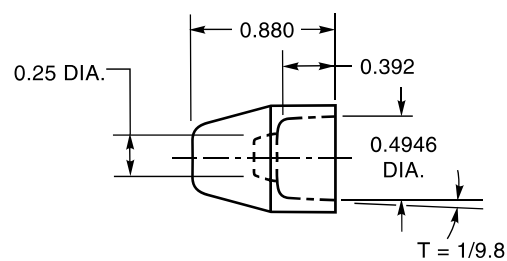
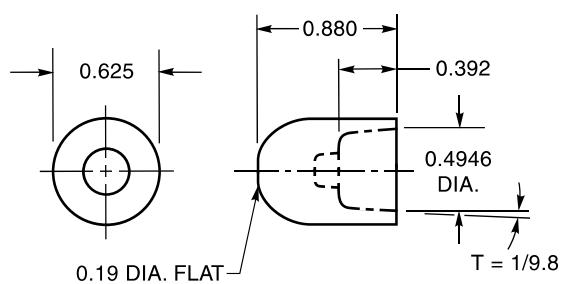
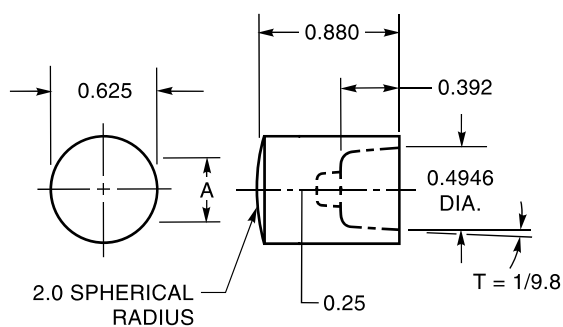
Table G.3M
Standard for Straight Adaptors for RWMA #6 Female Cap Electrodes

A	B	Cap	Code No.
60.4	38.1	MW6008	MW983-53
60.4	38.1	MW6146	MW1121-53
73.2	50.8	MW6146	MW1121-55
73.2	50.8	MW6008	MW983-55
85.9	63.5	MW6146	MW1121-57
85.9	63.5	MW6008	MW983-57
92.2	70.0	MW6146	MW1121-58
98.6	76.2	MW6146	MW1121-59
98.6	76.2	MW6008	MW983-59
104.9	82.5	MW6146	MW1121-60
111.3	88.9	MW6008	MW983-61
111.3	88.9	MW6146	MW1121-61
117.6	95.3	MW6146	MW1121-62
124.0	101.6	MW6008	MW983-63
124.0	101.6	MW6146	MW1121-63
136.7	114.3	MW6008	MW983-65
136.7	114.3	MW6146	MW1121-65
149.3	127.0	MW6008	MW983-67
149.3	127.0	MW6146	MW1121-67
162.1	139.7	MW6008	MW983-69
162.1	139.7	MW6146	MW1121-69

All dimensions in millimeters

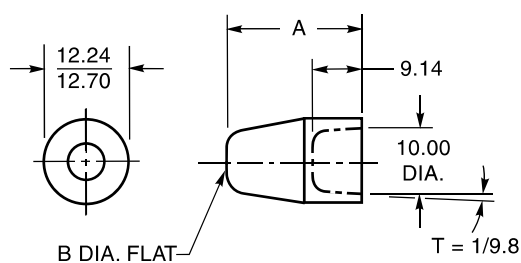


A	B	CODE NO.
0.590	0.25	MW6185
0.780	0.18	MW6484

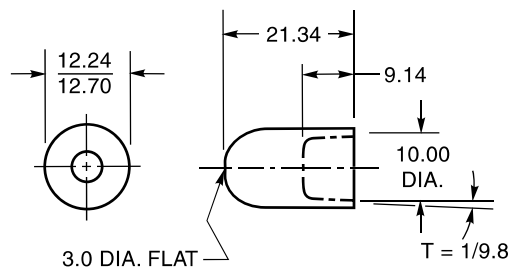
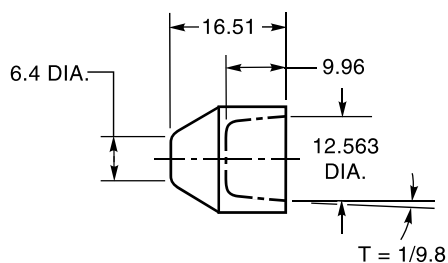
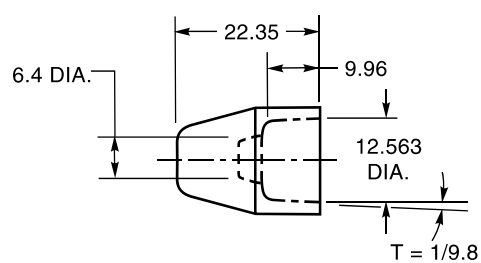
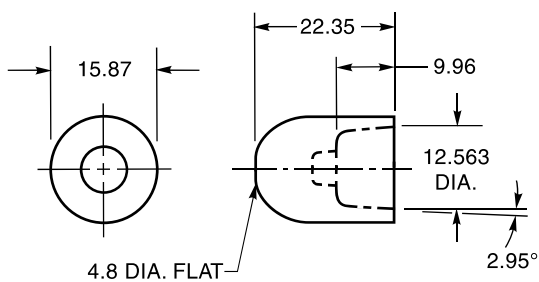
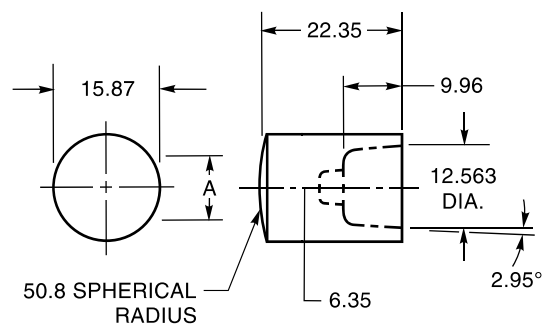
**MW6483****MW6183****MW6008****MW6006****MW6027**

All dimensions except degrees in inches

Figure G.4—Nomenclature for Female Electrode Caps



A	B	CODE NO.
15.00	6.4	MW6185
21.34	4.6	MW6484

**MW6483****MW6183****MW6008****MW6006****MW6027**

All dimensions except degrees in millimeters

Figure G.4M—Nomenclature for Female Electrode Caps

Annex H (Informative)

Guidelines for the Preparation of Technical Inquiries

This annex is not a part of AWS D8.6:2005, *Specification for Automotive Resistance Spot Welding Electrodes*, but is included for informational purposes only.

H1. Introduction

The American Welding Society (AWS) Board of Directors has adopted a policy whereby all official interpretations of AWS standards are handled in a formal manner. Under this policy, all interpretations are made by the committee that is responsible for the standard. Official communication concerning an interpretation is directed through the AWS staff member who works with that committee. The policy requires that all requests for an interpretation be submitted in writing. Such requests will be handled as expeditiously as possible, but due to the complexity of the work and the procedures that must be followed, some interpretations may require considerable time.

H2. Procedure

All inquiries shall be directed to:

Managing Director
Technical Services Division
American Welding Society
550 N.W. LeJeune Road
Miami, FL 33126

All inquiries shall contain the name, address, and affiliation of the inquirer, and they shall provide enough information for the committee to understand the point of concern in the inquiry. When the point is not clearly defined, the inquiry will be returned for clarification. For efficient handling, all inquiries should be typewritten and in the format specified below.

H2.1 Scope. Each inquiry shall address one single provision of the standard unless the point of the inquiry involves two or more interrelated provisions. The provision(s) shall be identified in the scope of the inquiry

along with the edition of the standard that contains the provision(s) the inquirer is addressing.

H2.2 Purpose of the Inquiry. The purpose of the inquiry shall be stated in this portion of the inquiry. The purpose can be to obtain an interpretation of a standard's requirement or to request the revision of a particular provision in the standard.

H2.3 Content of the Inquiry. The inquiry should be concise, yet complete, to enable the committee to understand the point of the inquiry. Sketches should be used whenever appropriate, and all paragraphs, figures, and tables (or annex) that bear on the inquiry shall be cited. If the point of the inquiry is to obtain a revision of the standard, the inquiry shall provide technical justification for that revision.

H2.4 Proposed Reply. The inquirer should, as a proposed reply, state an interpretation of the provision that is the point of the inquiry or provide the wording for a proposed revision, if this is what inquirer seeks.

H3. Interpretation of Provisions of the Standard

Interpretations of provisions of the standard are made by the relevant AWS technical committee. The secretary of the committee refers all inquiries to the chair of the particular subcommittee that has jurisdiction over the portion of the standard addressed by the inquiry. The subcommittee reviews the inquiry and the proposed reply to determine what the response to the inquiry should be. Following the subcommittee's development of the response, the inquiry and the response are presented to the entire committee for review and approval. Upon approval by the committee, the interpretation is an official

interpretation of the Society, and the secretary transmits the response to the inquirer and to the *Welding Journal* for publication.

H4. Publication of Interpretations

All official interpretations will appear in the *Welding Journal* and will be posted on the AWS web site.

H5. Telephone Inquiries

Telephone inquiries to AWS Headquarters concerning AWS standards should be limited to questions of a general nature or to matters directly related to the use of the standard. The AWS Board of Directors' policy requires that all AWS staff members respond to a telephone request for an official interpretation of any AWS standard with the information that such an interpretation can

be obtained only through a written request. Headquarters staff cannot provide consulting services. However, the staff can refer a caller to any of those consultants whose names are on file at AWS Headquarters.

H6. AWS Technical Committees

The activities of AWS technical committees regarding interpretations are limited strictly to the interpretation of provisions of standards prepared by the committees or to consideration of revisions to existing provisions on the basis of new data or technology. Neither AWS staff nor the committees are in a position to offer interpretive or consulting services on (1) specific engineering problems, (2) requirements of standards applied to fabrications outside the scope of the document, or (3) points not specifically covered by the standard. In such cases, the inquirer should seek assistance from a competent engineer experienced in the particular field of interest.

List of AWS Documents on Automotive Welding

Designation	Title
D8.6	<i>Specification for Automotive Resistance Spot Welding Electrode</i>
D8.7M	<i>Recommended Practices for Automotive Weld Quality—Resistance Spot Welding</i>
D8.8	<i>Specification for Automotive Frame Welding Quality—Arc Welding</i>
D8.9M	<i>Recommended Practices for Test Methods for Evaluating the Resistance Spot Welding Behavior of Automotive Sheet Steel Materials</i>
D8.14M	<i>Specification for Automotive and Light Truck Components Arc Welding—Aluminum</i>

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