SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE STANDARD

SAE J531 REV. MAY95

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Superseding J531 JUN93

An American National Standard

AUTOMOTIVE PIPE, FILLER, AND DRAIN PLUGS

1. ***Scope—***This SAE Standard includes complete general and dimensional specifications for those types of pipe, filler, and drain plugs (shown in Figures 1 to 6 and Tables 1 to 4) commonly used in automotive and related industrial applications.

2. ***References***

2.1 **Applicable Publications—**The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated the latest revision of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale PA 15096-0001.

SAE J476—Dryseal Pipe Threads
SAE J846—Coding Systems for Identification of Fluid Conductors and Connectors

2.1.2 ASTM PUBLICATION—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 117—Method of Salt Spray (Fog) Testing

3. ***General Specifications***

3.1 **Dimensions and Tolerances—**Except for nominal sizes and thread specifications, dimensions and tolerances are given in both SI and U.S. customary units as designated. Tabulated dimensions shall apply to the finished plugs, plated, hardened, or otherwise processed, as specified by the purchaser. The minimum across corner dimensions of external hexagons shall be 1.092 times the nominal width across flats. The minimum across corner dimensions of external squares shall be 1.25 times the nominal width across flats, but shall not result in a side flat width less than 0.75 times the nominal width across flats. At maximum material condition, the radii at corners of hexagon and square sockets in broached and upset plugs shall not exceed 0.13 mm (0.005 in). Tolerance on dimensions not otherwise limited shall be ±0.25 mm (±0.010 in).

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3.2 Pipe Threads—The pipe threads on automotive pipe plugs, unless there is specific authorization to the contrary, shall conform with the Dryseal American Standard Taper Pipe Thread (NPTF) and be gaged accordingly. The automotive pipe plug dimensions are based on the length of the NPTF thread and are intended for assembly with all types of Dryseal taper and straight internal threads. It is the consensus of manufacturers and users that trouble-free assembly and pressure-tight joints without lubricant or sealer cannot be assured.

The pipe threads on automotive filler and drain plugs, unless there is specific authorization to the contrary, shall conform with the Dryseal SAE Short Taper Pipe Thread (PTF-SAE Short) and be gaged accordingly. The automotive filler and drain plug dimensions are based on the length of the (PTF-SAE Short) thread and are primarily intended for assembly with Dryseal American Standard Taper (NPTF) or Dryseal American Standard Intermediate Straight (NPSI) internal pipe threads in installations where it is desirable to limit the entry of the small end of the plug. Limitations on other applications of this thread are explained in SAE J476.

External pipe threads shall be chamfered or rounded from the diameters tabulated in Table 1 to produce a length of chamfered or partial thread as specified. The threads on countersunk headless types of plugs shall be chamfered on both ends to the dimensions shown.

Related specifications covering blank sizes, dies, chasers, and gages are shown in SAE J476.

3.3 Material and Manufacture—Plugs may be made from low carbon steel, cast iron, malleable iron, brass, bronze, or aluminum alloy as specified by purchaser, by casting, milling from the bar, or upsetting from a grade of material free of defects which will affect their serviceability.

3.4 Finish—The external surfaces and threads of all carbon steel parts shall be plated or coated with a suitable material that passes a 72 h salt spray test in accordance with ASTM B 117. Any appearance of red rust during the 72 h salt spray test shall be considered failure, except for the following:

a. All internal fluid passages.
b. Edges such as hex points, serrations, and crests of threads where there may be mechanical deformation of the plating or coating typical of mass-produced parts or shipping effects.
c. Areas where there is mechanical deformation of the plating or coating caused by crimping, flaring, bending, and other post-plate metal forming operations.
d. Areas where the parts are suspended or affixed in the test chamber where condensate can accumulate.

NOTE—Cadmium plating is not preferred due to environmental reasons. Parts manufactured to this standard after January 1, 1997, shall not be cadmium plated. Internal fluid passages shall be protected from corrosion during storage. Changes in plating may affect assembly torques and require requalification, when applicable.

3.5 Workmanship—Workmanship shall conform to the best commercial practice to produce high-quality parts. Plugs shall be free from all hanging burrs, loose scale, and slivers which might become dislodged in usage and all other defects which might affect their serviceability.

TABLE 1—CHAMFER DIMENSIONS

Nominal Dryseal Pipe Thread Size in	Chamfer Dia at Small End of Plugs of All Types[1] Max mm	Chamfer Dia at Small End of Plugs of All Type[1] Max in	Chamfer Dia at Small End of Plugs of All Types[1] Min mm	Chamfer Dia at Small End of Plugs of All Types[1] Min in	Chamfer Dia at Large End of Countersunk Headless Plugs Max mm	Chamfer Dia at Large End of Countersunk Headless Plugs Max in
1/16	5.8	0.23	5.3	0.21	6.4	0.25
1/8	8.1	0.32	7.6	0.30	8.6	0.34
1/4	10.7	0.42	10.2	0.40	11.4	0.45
3/8	14.0	0.55	13.5	0.53	14.7	0.58
1/2	17.3	0.68	16.8	0.66	18.3	0.72
3/4	22.6	0.89	22.1	0.87	23.6	0.93
1	28.4	1.12	27.7	1.09	29.7	1.17

1. Tabulated diameters conform with Appendix A, SAE J476.

(Continued)

Nominal Dryseal Pipe Thread Size in	Chamfer Dia at Large End of Countersunk Headless Plugs Min mm	Chamfer Dia At Large End of Countersunk Headless Plugs Min in	Length of Chamfer or Partial Thread Max mm	Length of Chamfer or Partial Thread Max in	Length of Chamfer or Partial Thread Min mm	Length of Chamfer or Partial Thread Min in
1/16	5.8	0.23	1.42	0.056	0.94	0.037
1/8	8.1	0.32	1.42	0.056	0.94	0.037
1/4	10.9	0.43	2.11	0.083	1.42	0.056
3/8	14.2	0.56	2.11	0.083	1.42	0.056
1/2	17.8	0.70	2.72	0.107	1.80	0.071
3/4	23.1	0.91	2.72	0.107	1.80	0.071
1	29.0	1.14	3.30	0.130	2.21	0.087

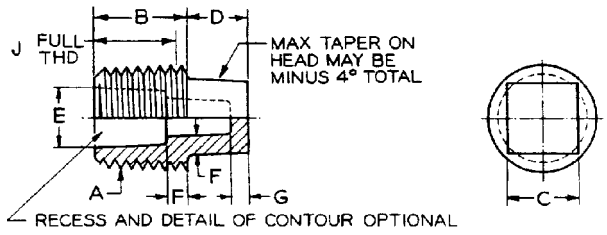

FIGURE 1A—SQUARE INSIDE HEAD PIPE PLUGS (130109A)

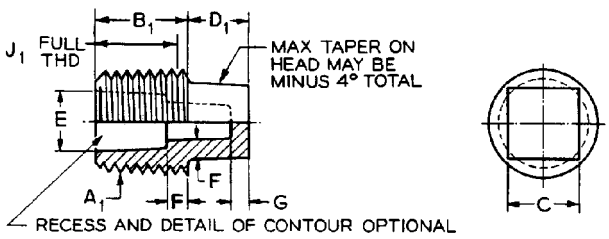

FIGURE 1B—SQUARE INSIDE HEAD FILLER AND DRAIN PLUGS[a] (130109B)

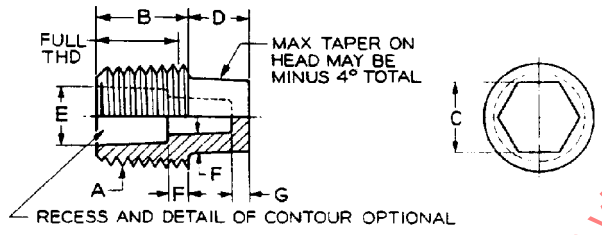

FIGURE 1C—HEXAGON INSIDE HEAD PIPE PLUGS (130109C)

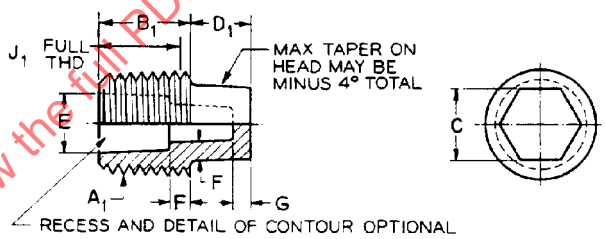

FIGURE 1D—HEXAGON INSIDE HEAD FILLER AND DRAIN PLUGS[a] (130109D)

FIGURE 1—SQUARE AND HEXAGON INSIDE HEAD PLUGS

CODES SHOWN IN BRACKETS ADJACENT TO FIGURE NUMBERS REPRESENT RESPECTIVE FITTING IDENTIFICATION IN ACCORDANCE TO SAE J846.

TABLE 2—DIMENSIONS OF SQUARE AND HEXAGON INSIDE HEAD PIPE, FILLER, AND DRAIN PLUGS (FIGURES 1A TO 1D)[1]

A Dryseal Thread NPTF, in	A_1 Dryseal Thread PTF-SAE Short, in	B Body Length[2] mm	B Body Length[2] in	B_1 Body Length[2] mm	B_1 Body Length[2] in	C Head Width mm	C Head Width in	D Head Height, Square Head mm	D Head Height, Square Head in
1/16–27	1/16–27	8.38	0.330	7.37	0.290	5.44	0.214	4.52	0.178
1/16–27	1/16–27	8.89	0.350	7.87	0.310	5.61	0.221	4.90	0.193
1/8–27	1/8–27	8.38	0.330	7.37	0.290	7.01	0.276	6.10	0.240
1/8–27	1/8–27	8.89	0.350	7.87	0.310	7.19	0.283	6.48	0.255
1/4–18	1/4–18	12.57	0.495	11.30	0.445	9.40	0.370	7.11	0.280
1/4–18	1/4–18	13.34	0.525	12.06	0.475	9.58	0.377	7.62	0.300
3/8–18	3/8–18	12.57	0.495	11.30	0.445	10.87	0.428	7.87	0.310
3/8–18	3/8–18	13.34	0.525	12.06	0.475	11.18	0.440	8.51	0.335
1/2–14	1/2–14	16.76	0.660	14.99	0.590	14.05	0.533	9.65	0.380
1/2–14	1/2–14	17.78	0.700	16.00	0.630	14.35	0.565	10.41	0.410
3/4–14	3/4–14	17.02	0.670	15.24	0.600	15.62	0.615	11.18	0.440
3/4–14	3/4–14	18.03	0.710	16.26	0.640	15.93	0.627	11.94	0.470
1–11-1/2	1–11-1/2	21.08	0.830	19.05	0.750	20.40	0.803	12.70	0.500
1–11-1/2	1–11-1/2	22.10	0.870	20.07	0.790	20.70	0.815	13.72	0.540

(Continued)

A Dryseal Thread NPTF, in	A_1 Dryseal Thread PTF-SAE Short, in	D_1 Head Height, Hex Inside Head mm	D_1 Head Height, Hex Inside head in	E Recess Dia, Max Ferrous mm	E Recess Dia, Max Ferrous in	E Recess Dia, Max Nonferrous mm	E Recess Dia, Max Nonferrous in
1/16–27	1/16–27	4.14	0.163	—	—	—	—
1/16–27	1/16–27	4.52	0.178				
1/8–27	1/8–27	5.72	0.225	—	—	—	—
1/8–27	1/8–27	6.10	0.240				
1/4–18	1/4–18	6.60	0.260	—	—	—	—
1/4–18	1/4–18	7.11	0.280				
3/8–18	3/8–18	7.24	0.285	7.9	0.31	9.1	0.36
3/8–18	3/8–18	7.87	0.310				
1/2–14	1/2–14	8.89	0.350	9.7	0.38	13.5	0.53
1/2–14	1/2–14	9.65	0.380				
3/4–14	3/4–14	10.41	0.410	14.2	0.56	18.3	0.72
3/4–14	3/4–14	11.18	0.440				
1–11-1/2	1–11-1/2	11.68	0.460	19.0	0.75	23.6	0.93
1–11-1/2	1–11-1/2	12.70	0.500				

(Continued on next page)

TABLE 2—DIMENSIONS OF SQUARE AND HEXAGON INSIDE HEAD PIPE, FILLER, AND DRAIN PLUGS (Figures 1A to 1D)(1) (Continued)

A Dryseal Thread NPTF, in	A_1 Dryseal Thread PTF-SAE Short in	Wall Thickness Min F Ferrous mm	Wall Thickness Min F Ferrous in	Wall Thickness Min F Nonferrous mm	Wall Thickness Min F Nonferrous in	Wall Thickness Min G Ferrous mm	Wall Thickness Min G Ferrous in
1/16–27	1/16–27	—	—	—	—	—	—
1/8–27	1/8–27	—	—	—	—	—	—
1/4–18	1/4–18	—	—	—	—	—	—
3/8–18	3/8–18	3.3	0.13	2.8	0.11	3.3	0.13
1/2–14	1/2–14	4.1	0.16	3.0	0.12	4.1	0.16
3/4–14	3/4–14	4.6	0.18	3.3	0.13	4.6	0.18
1–11-1/2	1–11-1/2	5.1	0.20	3.6	0.14	5.1	0.20

(Continued)

A Dryseal Thread NPTF, in	A_1 Dryseal Thread PTF-SAE Short in	Wall Thickness Min G Nonferrous mm	Wall Thickness Min G Nonferrous in	J Full Thread Length mm	J Full Thread Length in	J_1 Full Thread Length mm	J_1 Full Thread Length in
1/16–27	1/16–27	—	—	7.6	0.30	6.6	0.26
1/8–27	1/8–27	—	—	7.6	0.30	6.9	0.27
1/4–18	1/4–18	—	—	11.7	0.46	10.4	0.41
3/8–18	3/8–18	2.0	0.08	11.7	0.46	10.4	0.41
1/2–14	1/2–14	2.3	0.09	15.5	0.61	13.5	0.53
3/4–14	3/4–14	2.5	0.10	15.7	0.62	14.0	0.55
1–11-1/2	1–11-1/2	2.8	0.11	19.6	0.77	17.5	0.69

1. WARNING—AUTOMOTIVE FILLER AND DRAIN PLUGS ARE PRIMARILY INTENDED FOR INSTALLATION WHERE IT IS DESIRABLE TO LIMIT THE ENTRY OF THE SMALL END OF THE PLUG. SEE GENERAL SPECIFICATIONS.
2. Length B may be reduced one (p) thread if the thread is cut through at head corners.

HEXAGON OUTSIDE HEAD

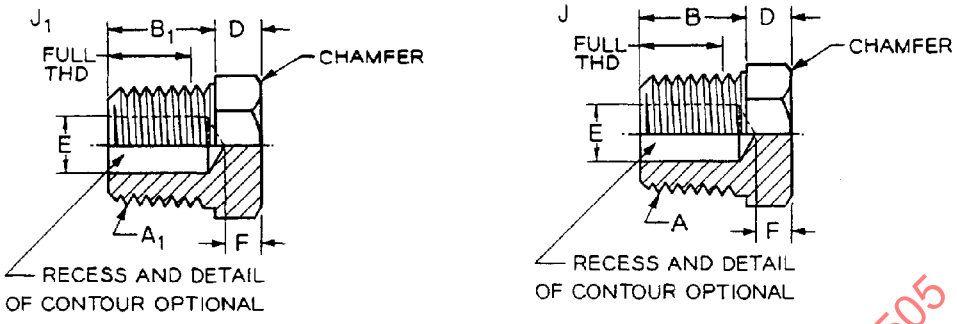

FIGURE 2A—HEXAGON OUTSIDE HEAD PIPE PLUGS (130109E)

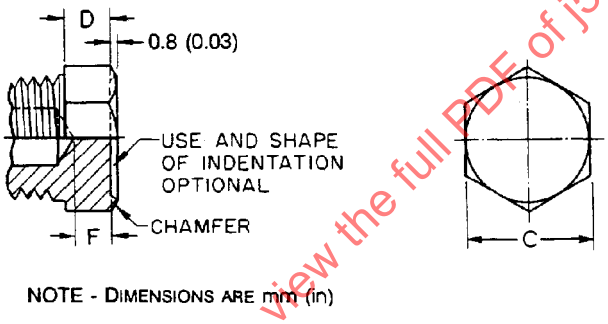

FIGURE 2B—HEXAGON OUTSIDE HEAD FILLER AND DRAIN PIPE PLUGS[1] (130109F)

CODES SHOWN IN BRACKETS ADJACENT TO FIGURE NUMBERS REPRESENT RESPECTIVE FITTING IDENTIFICATION IN ACCORDANCE TO SAE J846.

TABLE 3—DIMENSIONS OF HEXAGON OUTSIDE HEAD PIPE, FILLER, AND DRAIN PLUGS[1] (Figures 2a and 2b)

A Dryseal Thread NPTF, in	A_1 Dryseal Thread PTF-SAE Short, in	B Shoulder Length[2] mm	B Shoulder Length[2] in	B_1 Shoulder Length[2] mm	B_1 Shoulder Length[2] in	C Hex (Nom) in	D Head Height mm	D Head Height in
1/16–27	—	9.7	0.38	—	—	5/16	3.84	0.151
—	1/16–27	—	—	8.1	0.32	5/16	4.11	0.162
1/8–27	—	9.7	0.38	—	—	7/16	4.60	0.181
—	1/8–27	—	—	8.1	0.32	7/16	4.93	0.194
1/4–18	—	14.2	0.56	—	—	9/16	4.60	0.181
—	1/4–18	—	—	12.4	0.49	9/16	4.93	0.194
3/8–18	—	14.2	0.56	—	—	11/16	5.38	0.212
—	3/8–18	—	—	12.4	0.49	11/16	5.77	0.227
1/2–14	—	19.0	0.75	—	—	7/8	5.38	0.212
—	1/2–14	—	—	16.3	0.64	7/8	5.77	0.227
3/4–14	—	19.0	0.75	—	—	1-1/16	7.72	0.304
—	3/4–14	—	—	16.5	0.65	1-1/16	8.20	0.323
1–11-1/2	—	23.9	0.94	—	—	1-5/16	7.72	0.304
—	1–11-1/2	—	—	20.6	0.81	1-5/16	8.20	0.323

1. WARNING—AUTOMOTIVE FILLER AND DRAIN PLUGS ARE PRIMARILY INTENDED FOR INSTALLATION WHERE IT IS DESIRABLE TO LIMIT THE ENTRY OF THE SMALL END OF THE PLUG. SEE GENERAL SPECIFICATIONS.
2. Length B may be reduced one (p) thread if thread is cut through at head corners.

A Dryseal Thread NPTF, in	A_1 Dryseal Thread PTF-SAE Short, in	E Recess Dia, Max mm	E Recess Dia, Max in	F Wall Thickness Min mm	F Wall Thickness Min in	J Full Thread mm	J Full Thread in	J_1 Full Thread mm	J_1 Full Thread in
1/16–27	—	2.5	0.010	2.3	0.09	7.6	0.30	—	—
—	1/16–27	2.5	0.010	2.3	0.09	—	—	6.6	0.26
1/8–27	—	4.1	0.16	3.0	0.12	7.6	0.30	—	—
—	1/8–27	4.1	0.16	3.0	0.12	—	—	6.9	0.27
1/4–18	—	6.4	0.25	3.0	0.12	11.7	0.46	—	—
—	1/4–18	6.4	0.25	3.0	0.12	—	—	10.4	0.41
3/8–18	—	9.7	0.38	4.1	0.16	11.7	0.46	—	—
—	3/8–18	9.7	0.38	4.1	0.16	—	—	10.4	0.41
1/2–14	—	12.7	0.50	4.1	0.16	15.5	0.61	—	—
—	1/2–14	12.7	0.50	4.1	0.16	—	—	13.5	0.53
3/4–14	—	17.5	0.69	4.8	0.19	15.7	0.62	—	—
—	3/4–14	17.5	0.69	4.8	0.19	—	—	14.0	0.55
1–11-1/2	—	22.4	0.88	4.8	0.19	19.6	0.77	—	—
—	1–11-1/2	22.4	0.88	4.8	0.19	—	—	17.5	0.69

SQUARE AND HEXAGON COUNTERSUNK HEADLESS

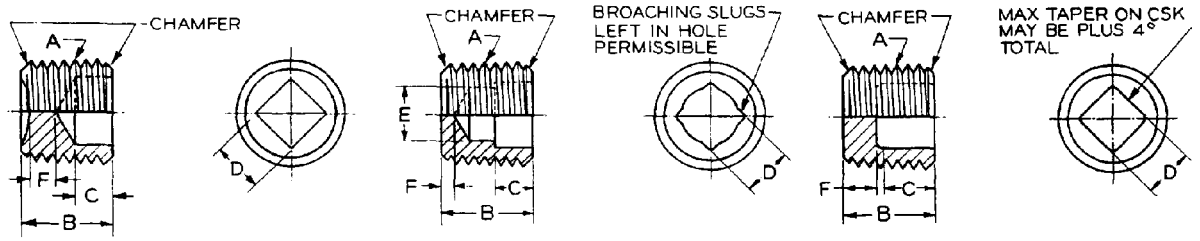

FIGURE 3A—UPSET (130109G)

FIGURE 3B—BROACHED (130109H)

FIGURE 3C—E CAST (130109J)

FIGURE 3—SQUARE COUNTERSUNK HEADLESS PIPE PLUGS (NPTF)

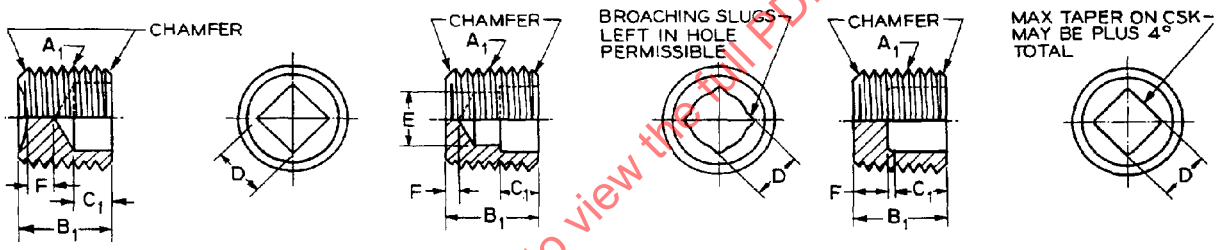

FIGURE 4A—UPSET (130109K)

FIGURE 4B—BROACHED (130109L)

FIGURE 4C—CAST (130109M)

FIGURE 4—SQUARE COUNTERSUNK HEADLESS FILLER AND DRAIN PLUGS (PTF)[1]

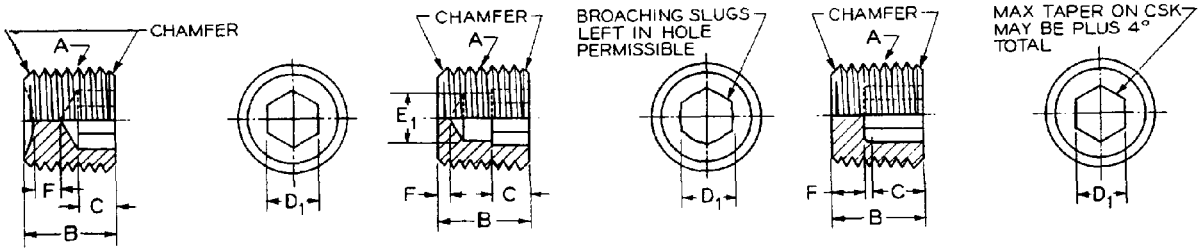

FIGURE 5A—UPSET (130109N)

FIGURE 5B—BROACHED (130109P)

FIGURE 5C—CAST (130109R)

FIGURE 5—HEXAGON COUNTERSUNK HEADLESS PIPE PLUGS (NPTF)

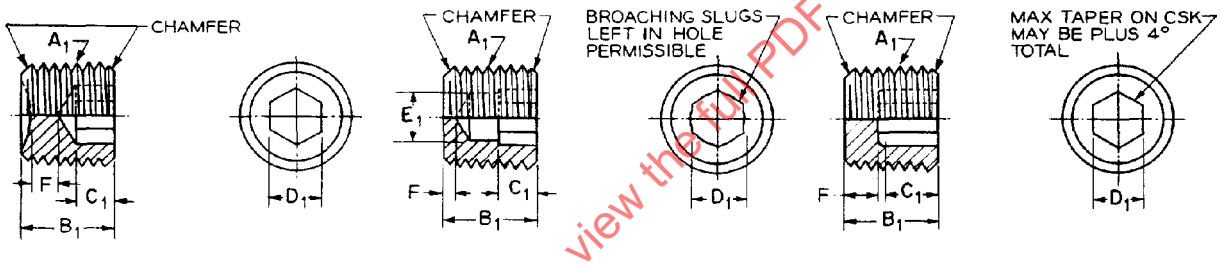

FIGURE 6A—UPSET (130109S)

FIGURE 6B—BROACHED (130109T)

FIGURE 6C—CAST (130109U)

FIGURE 6—HEXAGON COUNTERSUNK HEADLESS FILLER AND DRAIN PLUGS (PTF)[1]