FLARES FOR TUBING—SAE J533b

SAE Standard

Report of Parts and Fittings Technical Committee approved February 1947 and last revised by Tube, Pipe, Hose, and Lubrication Fittings Committee January 1972.

GENERAL SPECIFICATIONS

Scope—This SAE Standard covers specifications for 37 deg and 45 deg single and double flares for tube ends intended for use with 37 deg flared tube fittings and 45 deg flared or inverted flared tube fittings, respectively.

Dimensions—Dimensions in this standard are based on and, unless designated otherwise, are specified in inches, with metric equivalents shown in parentheses located adjacent to respective inch dimensions on illustrations or designated mm in text and tables, in accordance with SAE J916.

Single and double 45 deg flares shall conform to the dimensions specified in Fig. 2 and Table 1.

Single and double 37 deg flares shall conform to the dimensions specified in Fig. 3 and Table 2.

The following general specifications supplement the dimensional data with respect to unspecified detail and apply to both 37 deg and 45 deg flares for tubing.

Burring Prior to Flaring—To assure producing satisfactory flares, it may be necessary to perform burring operations on the tube end prior to flaring. Smoothly breaking the inside corner before single flaring ferrous, and some nonferrous tubing, is normally required to eliminate the cutoff burr which might otherwise create leakage paths across a substantial portion of the flare. Smoothly breaking the outside corner prior to single flaring, or both outside and inside corners prior to double flaring, shall be permissible on any tube material to minimize splitting.

Inasmuch as the specified dimensions shall prevail, whether or not the corners are broken, the quality of the finished flare shall be the only criterion applied to the burring operation.

Concentricity—Flare seat shall be concentric with tube outside diameter within 0.015 in. (0.38 mm) full indicator reading (FIR). To promote uniformity in checking concentricity of flare seat to the tube outside diameter, it is recommended the gaging method depicted in Fig. 1 and the following procedure, or equivalent means be used.

1. Mount tube in precision collet, dividing head, or equivalent rotational centering and clamping device with the rear of flare not more than 0.12 in. (3.04 mm) ahead of the collet. A minimum straight length of tube behind the flare of 1.00 in. (25.4 mm), or twice the tube outside diameter, whichever is greater, must be available for mounting purposes.
2. Place stylus of indicator gage on the coined portion of flare seat.
3. Rotate the mounted tube through full 360 deg revolution.
4. Read full indicator reading occurring over the 360 deg of rotation.

Workmanship—Flares shall be free from loose scale, burrs, slivers, and cracks. Seating surfaces shall be smooth and free from nicks, pit marks, and any other defects that prevent sealing.

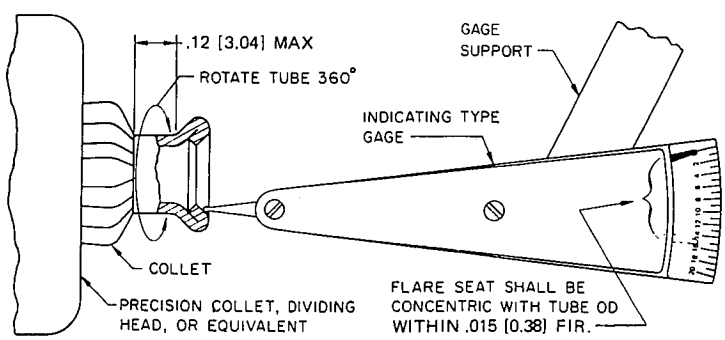

FIG. 1—TYPICAL FLARE CONCENTRICITY GAGE

TABLE 1—DIMENSIONS OF SINGLE AND DOUBLE 45-DEG FLARES FOR TUBING[a] (FIG. 2)

Nominal Tube OD		A Single Flare Diameter				A_1 Double Flare Diameter				B Single Flare Radius		B_1 Double Flare Radius		C Double Flare Coined Seat Length		D[b] Single Flare Wall Thickness		D_1[b] Double Flare Wall Thickness	
in	mm	in		mm		in		mm		in	mm	in	mm	in	mm	in	mm	in	mm
		Max	Min	Max	Min	Max	Min	Max	Min	±0.01	±0.25	±0.01	±0.25	Min	Min	Max	Max	Max	Max
1/8	3.18	0.181	0.171	4.59	4.35	0.213	0.198	5.41	5.03	0.02	0.51	0.04	1.02	0.040	1.02	0.035	0.88	0.025	0.63
3/16	4.76	0.249	0.239	6.32	6.08	0.280	0.265	7.11	6.74	0.02	0.51	0.04	1.02	0.040	1.02	0.035	0.88	0.028	0.71
1/4	6.35	0.325	0.315	8.25	8.01	0.360	0.345	9.14	8.77	0.02	0.51	0.04	1.02	0.040	1.02	0.049	1.24	0.035	0.83
5/16	7.94	0.404	0.388	10.26	9.86	0.425	0.410	10.79	10.42	0.02	0.51	0.04	1.02	0.062	1.57	0.049	1.24	0.035	0.88
3/8	9.52	0.487	0.471	12.36	11.97	0.500	0.485	12.70	12.32	0.02	0.51	0.04	1.02	0.062	1.57	0.065	1.65	0.049	1.24
7/16	11.11	0.561	0.545	14.24	13.85	0.570	0.555	14.47	14.10	0.02	0.51	0.04	1.02	0.062	1.57	0.065	1.65	0.049	1.24
1/2	12.70	0.623	0.607	15.82	15.42	0.640	0.625	16.25	15.88	0.02	0.51	0.04	1.02	0.062	1.57	0.083	2.10	0.049	1.24
9/16	14.29	0.676	0.660	17.17	16.77	0.712	0.697	18.08	17.71	0.02	0.51	0.04	1.02	0.062	1.57	0.083	2.10	0.049	1.24
5/8	15.88	0.748	0.732	18.99	18.60	0.772	0.757	19.60	19.23	0.02	0.51	0.04	1.02	0.062	1.57	0.095	2.41	0.049	1.24
3/4	19.05	0.916	0.900	23.26	22.86	0.912	0.897	23.16	22.79	0.02	0.51	0.04	1.02	0.062	1.57	0.109	2.76	0.049	1.24
7/8	22.22	1.041	1.025	26.44	26.04	—	—	—	—	0.02	0.51	—	—	—	—	0.109	2.76	—	—
1	25.40	1.157	1.141	29.38	28.99	—	—	—	—	0.02	0.51	—	—	—	—	0.120	3.04	—	—

[a] It is not the intent of this standard to define the appropriateness of fittings to be used in conjunction with the flares specified. Considerations such as the effects of wall thickness on working pressures, length of thread engagements, etc., shall be the responsibility of the user. See SAE J514.

[b] Recommended maximum nominal wall thickness of tubing normally considered suitable for flaring to the above specifications.

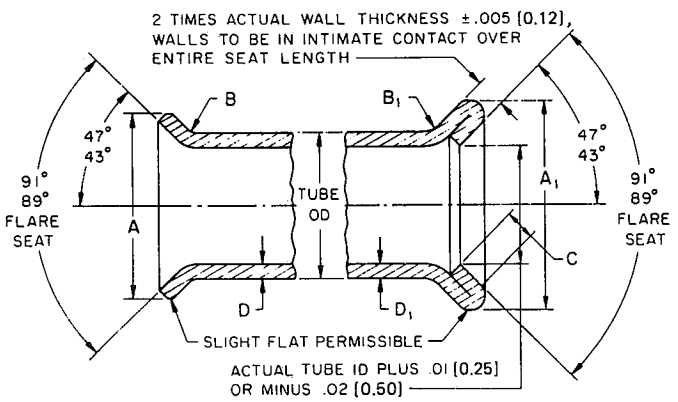

FIG. 2—SINGLE AND DOUBLE 45-DEG FLARES FOR TUBING

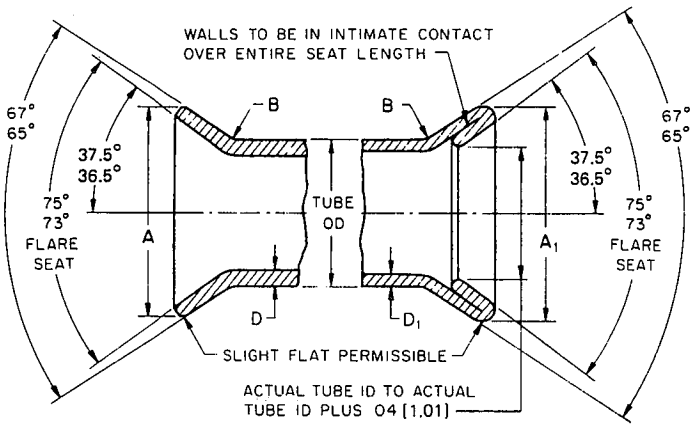

FIG. 3—SINGLE AND DOUBLE 37-DEG FLARES FOR TUBING

TABLE 2—DIMENSIONS OF SINGLE AND DOUBLE 37-DEG FLARES FOR TUBING[a] (FIG. 3)

Nominal Tube OD		A Single Flare Diameter				A_1 Double Flare Diameter				B Radius		D[b] Single Flare Wall Thickness		D_1[b] Double Flare Wall Thickness	
in	mm	in		mm		in		mm		in	mm	in	mm	in	mm
		Max	Min	Max	Min	Max	Min	Max	Min	±0.02	±0.5	Max	Max	Max	Max
1/8	3.18	0.200	0.180	5.08	4.58	0.200	0.180	5.08	4.58	0.03	0.8	0.035	0.88	0.025	0.63
3/16	4.76	0.280	0.260	7.11	6.61	0.280	0.260	7.11	6.61	0.03	0.8	0.035	0.88	0.028	0.71
1/4	6.35	0.360	0.340	9.14	8.64	0.360	0.340	9.14	8.64	0.03	0.8	0.065	1.65	0.035	0.88
5/16	7.94	0.430	0.400	10.92	10.16	0.430	0.400	10.92	10.16	0.03	0.8	0.065	1.65	0.035	0.88
3/8	9.52	0.490	0.460	12.44	11.69	0.490	0.460	12.44	11.69	0.04	1.0	0.065	1.65	0.049	1.24
1/2	12.70	0.660	0.630	16.76	16.01	0.660	0.630	16.76	16.01	0.06	1.5	0.083	2.10	0.049	1.24
5/8	15.88	0.790	0.760	20.06	19.31	0.790	0.760	20.06	19.31	0.06	1.5	0.095	2.41	0.049	1.24
3/4	19.05	0.950	0.920	24.13	23.37	0.950	0.920	24.13	23.37	0.08	2.0	0.109	2.76	0.049	1.24
7/8	22.22	1.070	1.040	27.17	26.42	1.070	1.040	27.17	26.42	0.08	2.0	0.109	2.76	0.065	1.65
1	25.40	1.200	1.170	30.48	29.72	1.200	1.170	30.48	29.72	0.09	2.3	0.120	3.04	0.065	1.65
1-1/8	28.58	1.380	1.350	35.05	34.29	1.380	1.350	35.05	34.29	0.09	2.3	0.120	3.04	0.065	1.65
1-1/4	31.75	1.510	1.480	38.35	37.60	1.510	1.480	38.35	37.60	0.09	2.3	0.120	3.04	0.065	1.65
1-1/2	38.10	1.730	1.700	43.94	43.18	1.730	1.700	43.94	43.18	0.11	2.8	0.120	3.04	0.065	1.65
1-3/4	44.45	2.110	2.080	53.59	52.84	2.110	2.080	53.59	52.84	0.11	2.8	0.120	3.04	0.065	1.65
2	50.80	2.360	2.330	59.94	59.19	2.360	2.330	59.94	59.19	0.11	2.8	0.134	3.40	0.065	1.65

[a] It is not the intent of this standard to define the appropriateness of fittings to be used in conjunction with the flares specified. Considerations such as the effects of wall thickness on working pressures, length of thread engagements, etc., shall be the responsibility of the user.

[b] Recommended maximum nominal wall thickness of tubing normally considered suitable for flaring to the above specifications.