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AEROSPACE STANDARD

AS 1520

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AREAS FOR CALCULATING STRESS OR LOAD VALUES FOR METRIC MJ EXTERNALLY THREADED FASTENERS

1. PURPOSE. This standard specifies the areas to be used in calculating stress or load values for use in metric externally threaded fastener procurement specifications and for information of designers.
2. SCOPE. Areas for the standard metric series of thread diameter-pitch combinations for aerospace externally threaded fasteners are established for the following conditions:
 - a) Area for ultimate shear stress or load in unthreaded shank.
 - b) Area for ultimate tensile stress or load in thread.
 - c) Area for stress durability test load in thread.
 - d) Area for stress-rupture test load at elevated temperature.
 - e) Area for tension-tension fatigue test load.
3. REQUIREMENT. The following areas are to be used in metric fastener procurement specifications for establishing the minimum mechanical properties which are specified in terms of allowable minimum test loads (unit stress rating times area).
 - 3.1 Area for ultimate stress or load in unthreaded fastener shank.

Area based on the nominal unthreaded fastener shank diameter, d .

$$(1) A = 0.7854(d)^2$$
 - 3.2 Area for ultimate tensile stress or load in threaded portion.

Area based on the basic pitch diameter, d_2 . (Preferred formula)

$$(2) A = 0.7854(d_2)^2$$

Stress area based on the mean diameter between the minimum pitch diameter, d_2 min, and the maximum minor diameter, d_3 max at $2/3 H$ thread depth, may be used for threads rolled before heat treatment.

$$(3) A = 0.7854[0.5(d_2 \text{ min} + d_3 \text{ max})]^2$$
 - 3.3 Area for stress durability test load in thread.

Area based on formula (2). Test load is derived by using a percentage of the ultimate tensile stress as defined in the procurement specification.
 - 3.4 Area for stress-rupture test load at elevated temperature.

Area based on the maximum minor diameter, d_3 max, at $2/3 H$ thread depth.

$$(4) A = 0.7854(d_3 \text{ max})^2$$

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3.5 Area for tension-tension fatigue test load.

Area based on formula (2). High test load is derived by using a percentage of the ultimate tensile stress as defined in the procurement specification.

Low test load is 10% of high test load.

4. SYMBOLS. Thread symbols in formulae are per AS1370.

TABLE I

Areas for Externally Threaded Fasteners with Metric MJ Threads, mm²

Nominal Thread Size 4h6h	Single-Shear Cross-Section Area Formula (1)	Tension Cross-Section Area Formula (2)	Tension Cross-Section Area Formula (3)	Stress-Rupture Cross-Section Area Formula (4)
MJ1.6 x 0.35	2.01	1.48	1.26	1.12
MJ2 x 0.4	3.14	2.38	2.06	1.86
MJ2.5 x 0.45	4.91	3.83	3.37	3.08
MJ3 x 0.5	7.07	5.62	5.01	4.61
MJ3.5 x 0.6	9.62	7.60	6.75	6.19
MJ4 x 0.7	12.6	9.87	8.76	8.00
MJ5 x 0.8	19.6	15.8	14.2	13.0
MJ6 x 1	28.3	22.5	20.1	18.4
MJ7 x 1	38.5	31.7	28.9	26.8
MJ8 x 1	50.3	42.4	39.2	36.8
MJ10 x 1.25	78.5	66.3	61.3	57.5
MJ12 x 1.25	113	98.3	92.1	87.5
MJ14 x 1.5	154	133	125	118
MJ16 x 1.5	201	177	167	160
MJ18 x 1.5	254	228	216	208
MJ20 x 1.5	314	284	272	262
MJ22 x 1.5	380	347	333	323
MJ24 x 2	452	405	385	370
MJ27 x 2	573	519	497	479
MJ30 x 2	707	647	622	602
MJ33 x 2	855	789	762	740
MJ36 x 2	1020	946	916	891
MJ39 x 2	1200	1120	1084	1060

Note: Diameter used to determine areas are as follows:

Formula (1) d = nominal unthreaded shank

Formula (2) d_2 = thread basic pitch diameter

Formula (3) $0.5(d_2 \text{ min} + d_3 \text{ max})$ = mean diameter between minimum pitch diameter and maximum minor diameter at $2/3 H$ thread depth

Formula (4) $d_3 \text{ max}$ = maximum minor diameter at $2/3 H$ thread depth

Prepared By Committee E21

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