Thread Stripping Strength and Length of Engagement

Stripping shear areas of external and internal metric threads, the stripping loads, the bolt breaking load and the engagement length at which they balance.

Method: Thread stripping areas (FED-STD-H28 form); Federal Standard FED-STD-H28/2B; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Nominal (major) diameter	12.000	mm
Pitch	1.7500	mm
Length of engagement	10.000	mm
Bolt tensile strength	800.00	MPa
Bolt material shear strength	480.00	MPa
Nut (or tapped part) shear strength	300.00	MPa

Calculated results

Parameter	Value	Unit
Tensile stress area	84.267	mm²
External thread stripping area	238.11	mm²
Internal thread stripping area	329.87	mm²
Bolt breaking load	67.413	kN
Lower stripping load (external or internal)	98.960	kN
Engagement for stripping = bolt break	6.8122	mm

Notes for this case

• The external thread strips by shearing along a cylinder near the internal thread's minor diameter, and the internal thread along a cylinder near the external major diameter. The FED-STD-H28 area equations, evaluated here with basic (nominal) ISO dimensions $d_2 = d - 0.6495P$ and $D_1 = d - 1.0825P$, give $A_s = \pi n L_e D_1[1/2n + 0.57735(d_2 - D_1)]$ and $A_n = \pi n L_e d[1/2n + 0.57735(d - d_2)]$. A joint should fail by bolt fracture rather than stripping, so the engagement should exceed the length at which both stripping loads equal the bolt breaking load $R_m \cdot A_t$. Tolerances, nut dilation and thread bending reduce the real strength; use minimum-material dimensions for design.

Formula and method

$$A_s = \pi n L_e D_1 \left[\frac{1}{2n} + 0.57735(d_2 - D_1)\right], \quad A_n = \pi n L_e d \left[\frac{1}{2n} + 0.57735(d - d_2)\right]$$

Variables

d	Nominal (major) diameter	m
P	Pitch	m
L_e	Length of engagement	m
$R_{m,b}$	Bolt tensile strength	Pa
τ_b	Bolt material shear strength	Pa
τ_n	Nut (or tapped part) shear strength	Pa
A_t	Tensile stress area	m²
A_s	External thread stripping area	m²
A_n	Internal thread stripping area	m²
F_b	Bolt breaking load	N

F_s	Lower stripping load (external or internal)	N
L_{req}	Engagement for stripping = bolt break	m

Method and standards

Thread stripping.

Assumptions and limits

- Basic ISO profile; uniform load sharing along the engagement.

References

Thread stripping areas (FED-STD-H28 form), Federal Standard FED-STD-H28/2B, Screw-Thread Standards for Federal Services (stripping area equations, method)

Report details

Report reference	FCC-K5FV-FBNG (the same inputs always give the same reference)
Generated	23 November 2026, 18:24 UTC
Calculator	Thread Stripping Strength and Length of Engagement
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

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