Notch Sensitivity and Fatigue Notch Factor (Peterson)

Peterson's notch sensitivity q from the notch radius and a material constant, the fatigue notch factor K_f from K_t and the notched endurance limit.

Method: Peterson's notch sensitivity

Input parameters

Unit system: SI

Parameter	Value	Unit
Theoretical stress concentration factor	2.2000	
Notch root radius	1.0000	mm
Ultimate tensile strength (steel)	700.00	MPa
Peterson constant (0 to estimate from S_u)	0	mm
Unnotched endurance limit	300.00	MPa

Calculated results

Parameter	Value	Unit
Peterson constant used	0.17881	mm
Notch sensitivity	0.84831	
Fatigue notch factor	2.0180	
Notched endurance limit	148.66	MPa

Notes for this case

• Peterson: q = 1/(1 + a/r), K_f = 1 + q(K_t − 1). For steels the material constant can be estimated as a = 0.0254 mm·(2070 MPa/S_u)^1.8 (strengths above about 550 MPa); stronger steels have smaller a and are more notch-sensitive. Sharp notches (small r) give q well below 1, so K_f < K_t. Enter a directly for other materials (aluminium alloys have larger a).

Formula and method

$$q = \frac{1}{1 + a/r}, \quad K_f = 1 + q(K_t - 1), \quad a = 0.0254 \left(\frac{2070}{S_u}\right)^{1.8} \text{ mm}$$

Variables

K_t	Theoretical stress concentration factor	-
r	Notch root radius	m
S_u	Ultimate tensile strength (steel)	Pa
a	Peterson constant (0 to estimate from S_u)	m
S_e	Unnotched endurance limit	Pa
q	Notch sensitivity	-
K_f	Fatigue notch factor	-
S_e/K_f	Notched endurance limit	Pa

Method and standards

Notch sensitivity.

Assumptions and limits

- High-cycle fatigue; steel correlation for a; S_u in MPa.

References

Peterson's notch sensitivity

Report details

Report reference	FCC-EBNA-6CEC (the same inputs always give the same reference)
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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

https://calc.firecad.com/materials/properties/peterson-notch-sensitivity

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.