Shot Peening Coverage and Exposure Time

Coverage after a peening time from a measured coverage at a reference time (Avrami law), the time for 98 % (full) coverage and for a multiple of it.

Method: Random-impact coverage (Avrami) model

Input parameters

Unit system: SI

Parameter	Value	Unit
Coverage measured after the reference time	60.000	%
Reference time	10.000	s
Peening time of interest	30.000	s
Coverage multiple wanted (1 = 98 %)	2.0000	

Calculated results

Parameter	Value	Unit
Coverage rate constant	0.091629	1/s
Coverage after the time	93.600	%
Time for full (98 %) coverage	42.694	s
Time for the coverage multiple	85.388	s

Notes for this case

• Random impacts give C = 1 − exp(−At); coverage of 98 % is called full (100 %) coverage because true 100 % needs infinite time. '200 %' means twice the time for 98 %. Saturation (Almen) intensity is a separate check.

Formula and method

$$C = 1 - e^{-At}, \quad A = -\frac{\ln(1 - C_1)}{t_1}, \quad t_{98} = \frac{\ln 50}{A}$$

Variables

C_1	Coverage measured after the reference time	-
t_1	Reference time	s
t	Peening time of interest	s
m	Coverage multiple wanted (1 = 98 %)	-
A	Coverage rate constant	1/s
C	Coverage after the time	-
t_{98}	Time for full (98 %) coverage	s
t_m	Time for the coverage multiple	s

Method and standards

Coverage model.

Assumptions and limits

- Random, uniform impacts.

References

Random-impact coverage (Avrami) model

Report details

Report reference	FCC-K4XV-C60N (the same inputs always give the same reference)
Generated	23 November 2026, 18:08 UTC
Calculator	Shot Peening Coverage and Exposure Time
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

https://calc.firecad.com/materials/heat-treatment/shot-peening-coverage

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.