



11.1 Fatigue analysis – Plate element

REFERENCE	Goodman ¹ , Gerber H ²
ELEMENTS	Plate element
MODEL FILENAME	Fatigue01.fea

Fatigue analysis is performed base on S-N curve. One cycle of reversed edge pressure is applied on a low order quadrilateral plate element. The effect of mean stress is considered on two parameters of fatigue analysis, life cycle and damage, respectively.

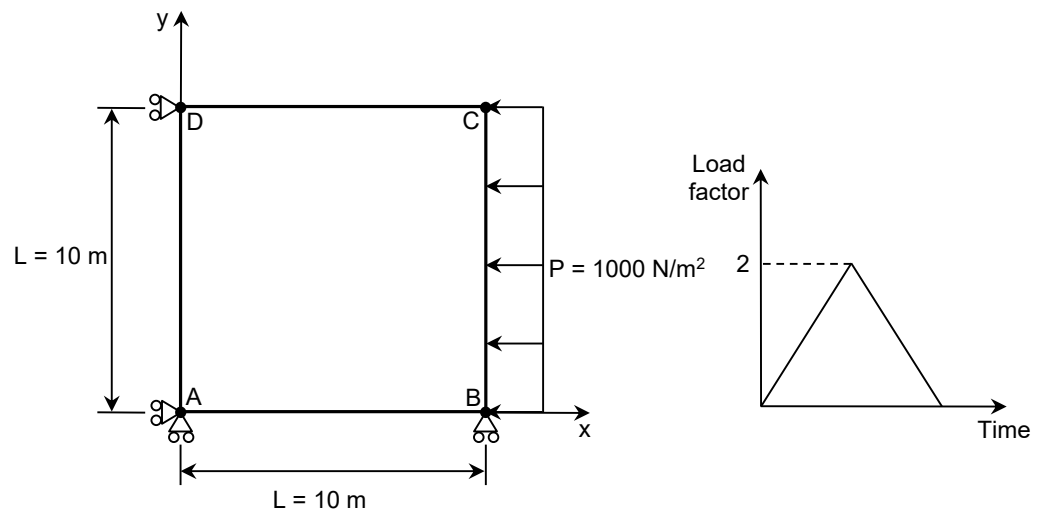


Figure 11.1.1
Geometry and load
curve

Material data	Young's modulus	10,000 N/m ²
Fatigue Data	Elastic modulus	10,000 N/m ²
	Tensile strength	111111.111 N/m ²
	Endurance limit	100 N/m ²
	Cycle at endurance	1,000,000 cycles
	Stress option	Von Misses (average)
	Mean stress correction	None, Goodman, Gerber
Fatigue Load	Concentration factor	1.0
	Number of load cycles	1 cycle

*Table 12.1.1 Life cycle results*

Mean Stress Correction	None	Goodman	Gerber
Reference	1.0000E+05	9.9100E+04	9.9992E+04
Life cycle (cycles)			

Table 12.1.1 Damage results

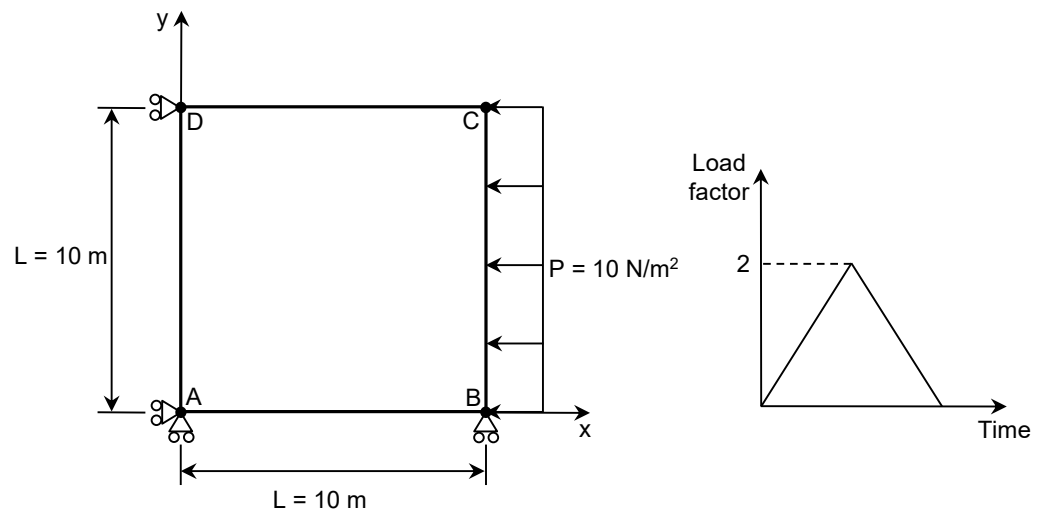
Mean Stress Correction	None	Goodman	Gerber
Reference	1.0000E-03	1.0091E-03	1.0001E-03
Damage (percentage)			



11.2 Fatigue analysis – Plain strain element

REFERENCE	Goodman ¹ , Gerber H ²
ELEMENTS	Plain strain element
MODEL FILENAME	Fatigue02.fea

Fatigue analysis is performed base on S-N curve. One cycle of reversed edge pressure is applied on a low order quadrilateral plane strain element. The effect of mean stress is considered on two parameters of fatigue analysis, life cycle and damage, respectively.



Material data	Young's modulus	10,000 N/m ²
Fatigue Data	Elastic modulus	10,000 N/m ²
	Tensile strength	111111.111 N/m ²
	Endurance limit	100 N/m ²
	Cycle at endurance	1,000,000 cycles
	Stress option	Von Misses (average)
	Mean stress correction	None, Goodman, Gerber
Fatigue Load	Concentration factor	1.0
	Number of load cycles	1 cycle

*Table 12.2.1 Life cycle results*

Mean Stress Correction	None	Goodman	Gerber
Reference	1.0000E+05	9.9100E+04	9.9992E+04
Life cycle (cycles)			

Table 12.2.1 Damages results

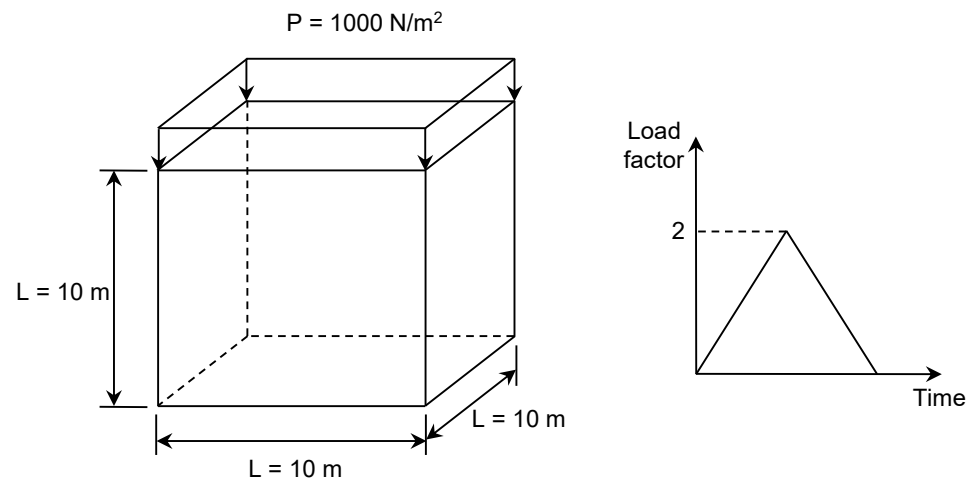
Mean Stress Correction	None	Goodman	Gerber
Reference	1.0000E-03	1.0091E-03	1.0001E-03
Damage (percentage)			



11.3 Fatigue analysis – Solid element

REFERENCE	Goodman ¹ , Gerber ²
ELEMENTS	Solid element
MODEL FILENAME	Fatigue03.fea

Fatigue analysis is performed base on S-N curve. One cycle of reversed face pressure is applied on an 8-node solid element's face. The effect of mean stress is considered on two parameters of fatigue analysis, life cycle and damage, respectively.



.3

Material data	Young's modulus	10,000 N/m ²
Fatigue Data	Elastic modulus	10,000 N/m ²
	Tensile strength	111111.111 N/m ²
	Endurance limit	100 N/m ²
	Cycle at endurance	1,000,000 cycles
	Stress option	Von Misses (average)
	Mean stress correction	None, Goodman, Gerber
Fatigue Load	Concentration factor	1.0
	Number of load cycles	1 cycle

*Table 12.3.1 Life cycle results*

Mean Stress Correction	None	Goodman	Gerber
Reference	1.0000E+05	9.9100E+04	9.9992E+04
Life cycle (cycles)	1.0000E+05	9.9100E+04	9.9992E+04

Table 12.3.2 Damages results

Mean Stress Correction	None	Goodman	Gerber
Reference	1.0000E-03	1.0091E-03	1.0001E-03
Damage (percentage)	1.0000E-03	1.0091E-03	1.0001E-03



References

- ¹ Goodman J., "Mechanics applied to engineering", London: Longmans Green, 1899
- ² Gerber H., "Bestimmung der Zulässigen Spannungen in Eisen-konstruktionen, Z Bayer Arch Ingenieur-Vereins 6:101-110, 1874