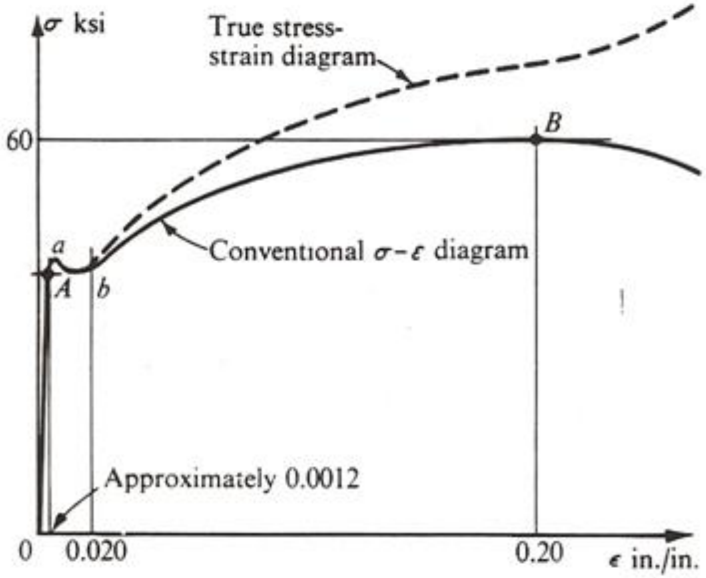
Ensaios uniaxiais

Diagramas de tensão - deformação



(a) Mild steel

Fig. 4-12. Stress-strain diagrams.

Aço laminado a quente

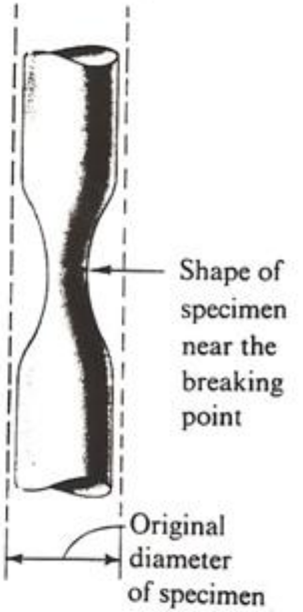


Fig. 4-13. Typical contraction of a specimen of mild steel in tension near the breaking point.

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E. P. Popov

Ensaios uniaxiais

Diagramas de tensão - deformação

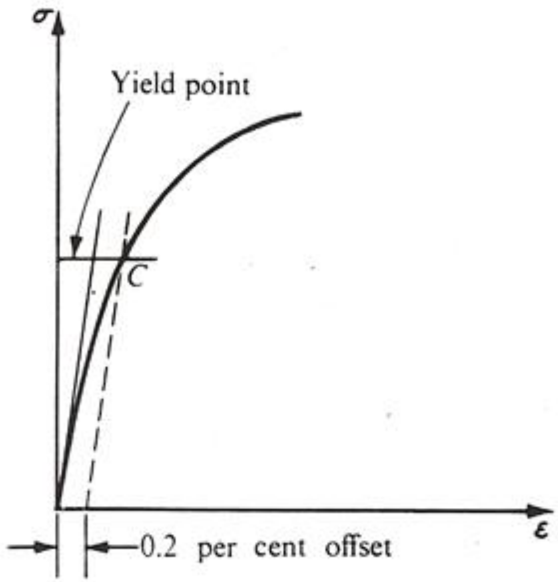
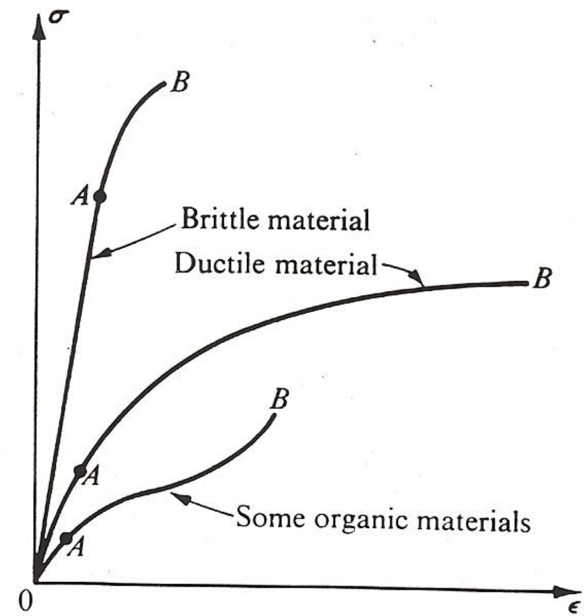


Fig. 4-14. Offset method of determining the yield point of a material.

Aço encruado por laminação a frio



(b) Typical materials

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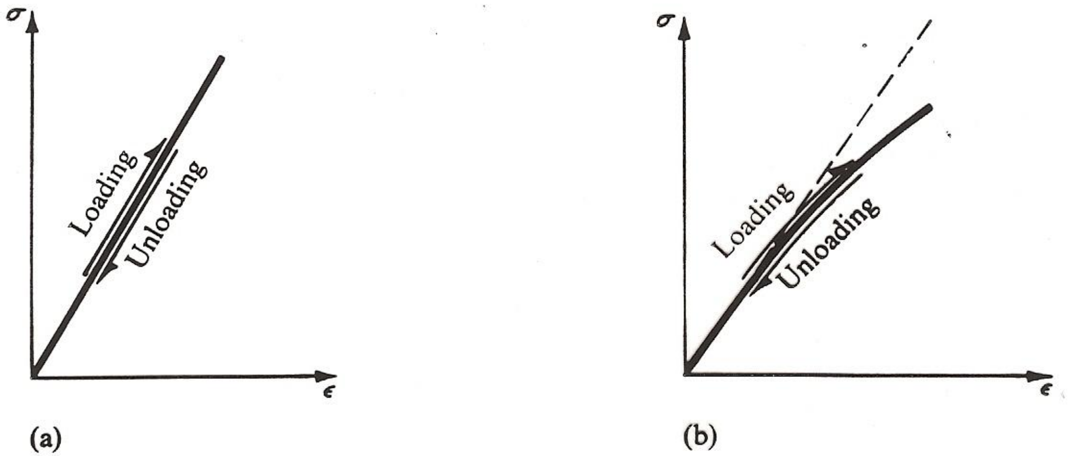
Diagramas de tensão – deformação em carga e descarga
Materiaís elásticos



linear **não-linear**

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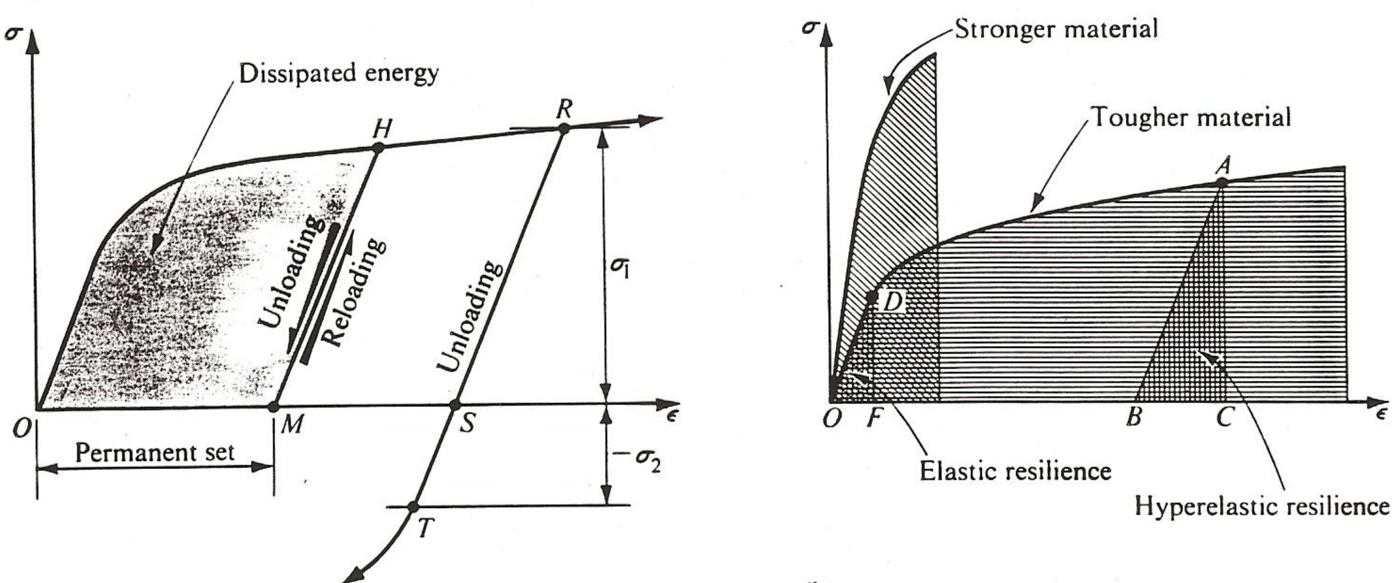
Diagramas de tensão – deformação em carga e descarga
Algumas propriedades típicas



(a) (b)

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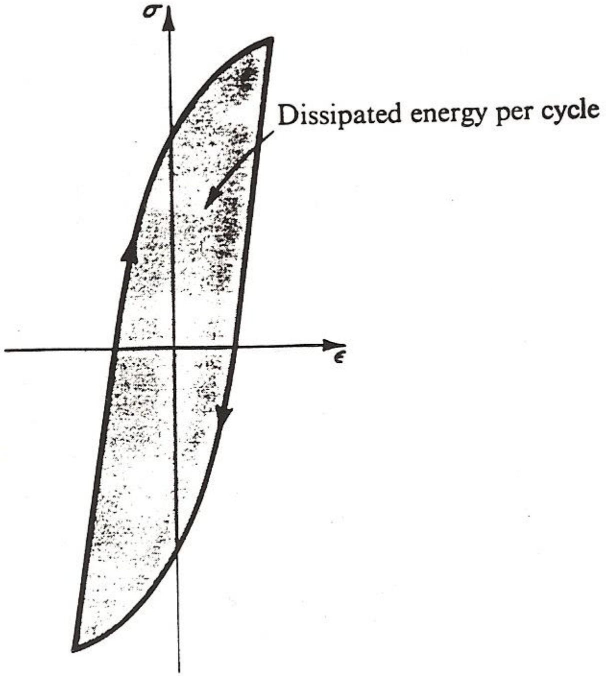
Ensaios uniaxiais

Diagramas de tensão – deformação em carga e descarga
Loop de histerese para material inelástico



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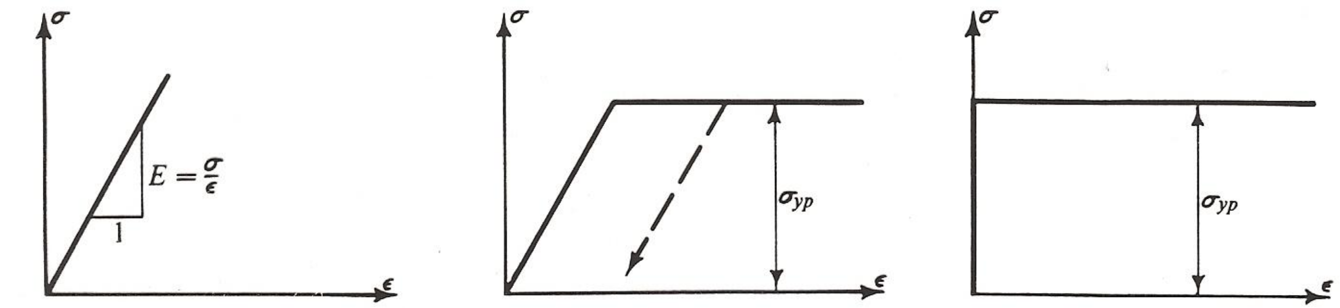
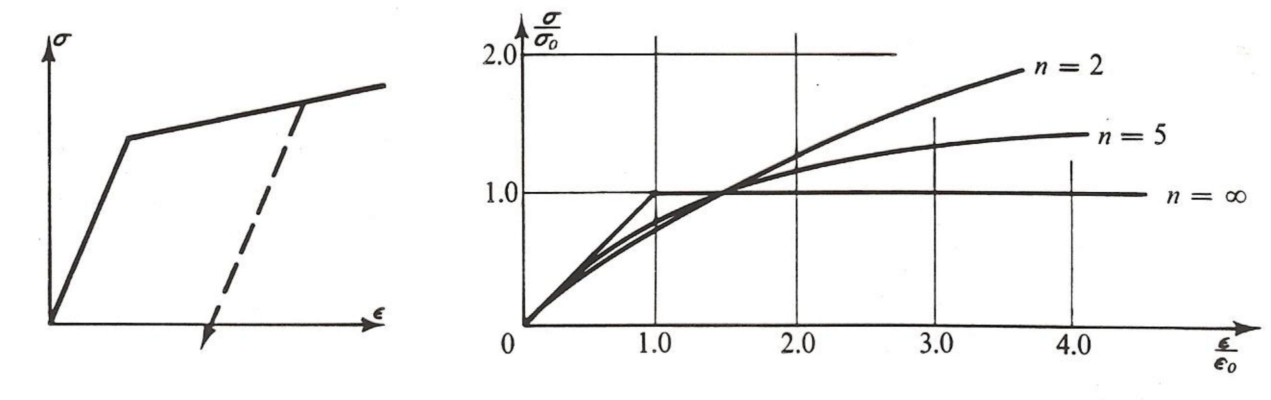
Relações constitutivas para análise unidimensional

Diagramas de tensão – deformação idealizados
sem variação no tempo



(a) Linearly elastic material (b) Elastic, perfectly plastic material (c) Rigid, perfectly plastic material



(d) Elastic, linearly hardening material (e) Ramberg – Osgood diagrams

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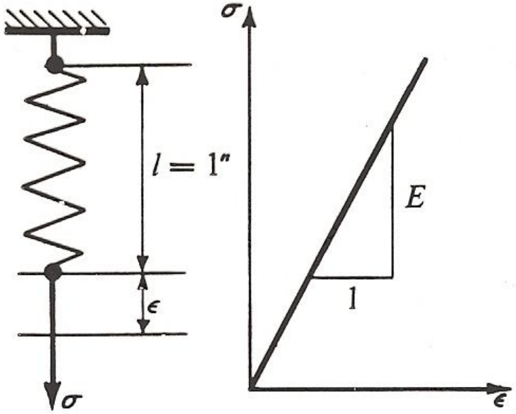
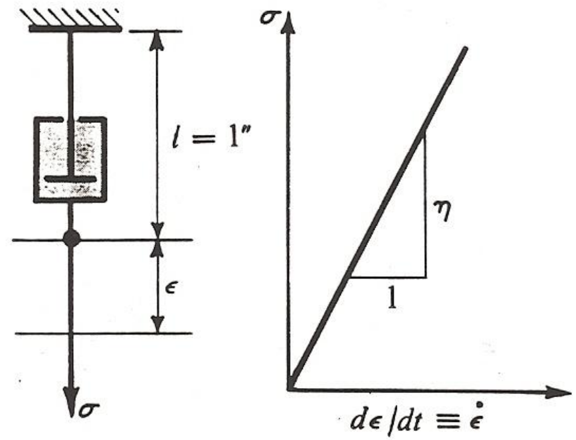
E. P. Popov

Relações constitutivas para análise unidimensional

Materiais viscoelásticos lineares:
Mola de Hooke e Líquido de Newton



(a) Hookean spring



(b) Newtonian dashpot

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Relações constitutivas para análise unidimensional

Materiais viscoelásticos lineares: Líquido ou Sólido de Maxwell

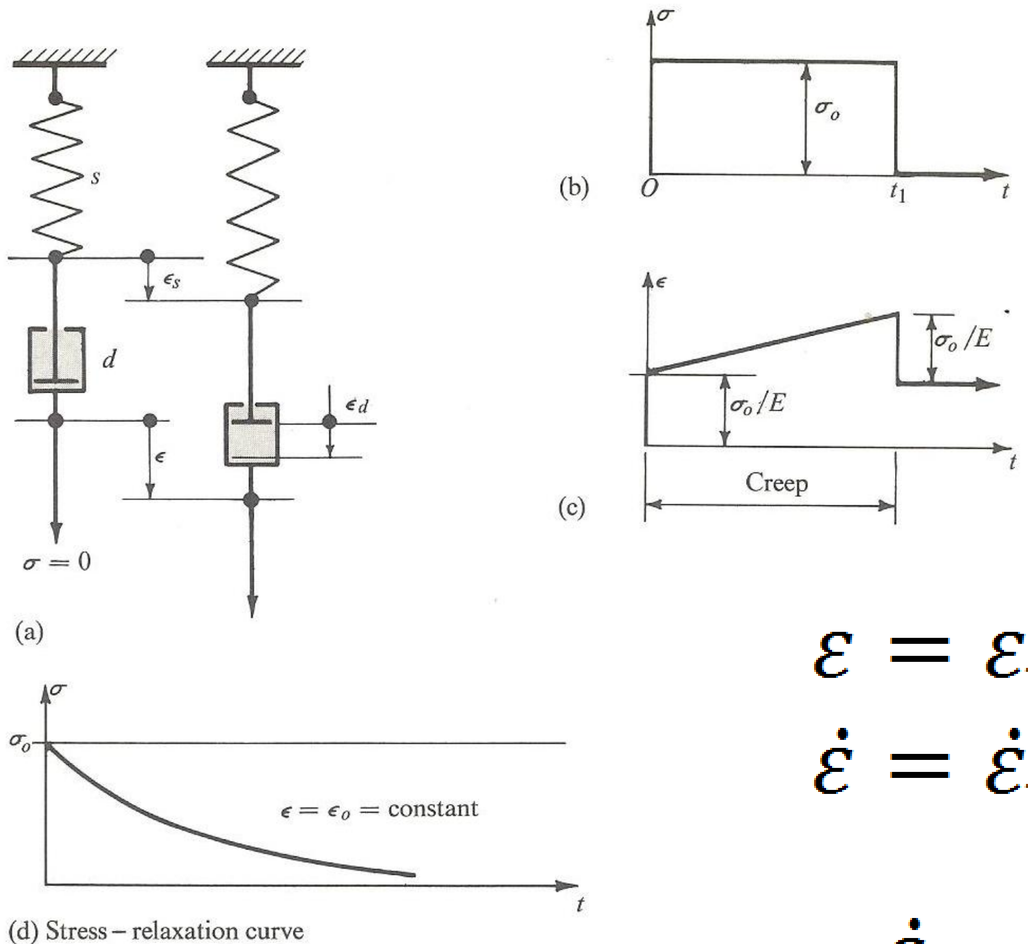

Figura: Introduction to mechanics of solids
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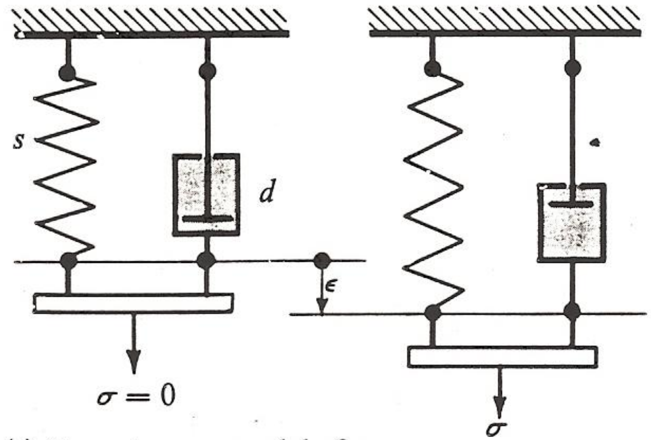
$$\varepsilon = \varepsilon_m + \varepsilon_{am}$$

$$\dot{\varepsilon} = \dot{\varepsilon}_m + \dot{\varepsilon}_{am}$$

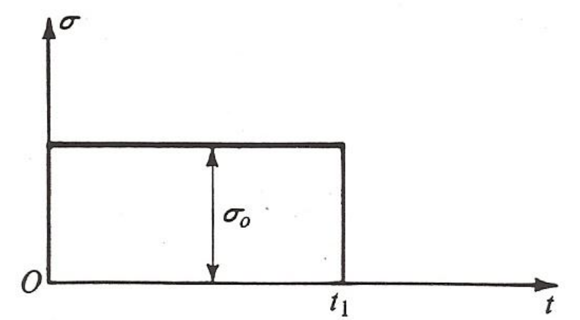
$$\dot{\varepsilon} = \frac{\dot{\sigma}}{E} + \frac{\sigma}{\eta}$$

Relações constitutivas para análise unidimensional

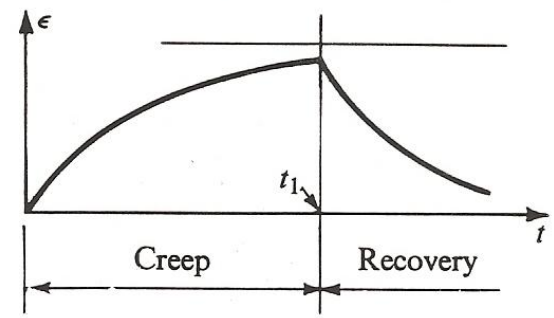
Materiais viscoelásticos lineares:
Sólido de Voigt-Kelvin



(c) Two-element model of a Voigt–Kelvin solid



(d)



(e) Creep curve

$$\sigma = \sigma_m + \sigma_{am}$$

$$\sigma = E\varepsilon + \eta\dot{\varepsilon}$$

Figura: Introduction to mechanics of solids
E. P. Popov

Relações constitutivas para análise unidimensional

Material elastoplástico perfeito
Diagrama tensão – deformação
Idealizado sem variação no tempo