

Failure of brittle materials

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The three standard theories of failure for brittle material are summarized below.

Maximum normal stress (MNS) theory

Simply put, MNS theory predicts failure whenever

$$\sigma_1 \geq S_u$$

Including a factor of safety n , failure is predicted when

$$\sigma_1 \geq n S_u$$

Brittle Coulomb-Mohr (BCM) theory

Brittle Coulomb-Mohr theory is identical to the ductile Coulomb-Mohr theory, but with ultimate strengths.

With a factor of safety n , it predicts failure when

$$\frac{\sigma_1}{S_u} - \frac{\sigma_3}{S_c} \geq \frac{1}{n}$$

Modified Mohr (MM) theory

Based on experimental results, MM theory predicts a less-conservative-than-BCM failure envelope with the prediction of failure if

$$\frac{\sigma_1}{S_u} - \frac{\sigma_3}{S_c} \geq \frac{1}{n}$$