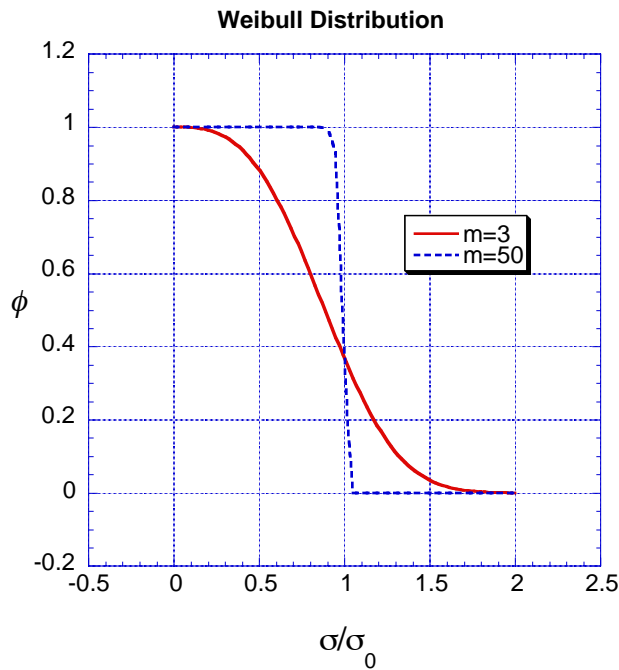


## Weibull Distribution

Ceramics tested under a three-point or four-point failure test exhibit a distribution of failures. For samples of constant size and shape, the resultant distribution is:

$$\phi = \exp\left\{-\left(\frac{\sigma}{\sigma_0}\right)^m\right\},$$

where  $\phi$  is the survival probability at a given stress,  $\sigma$  is the applied stress,  $\sigma_0$  is the stress at which  $1/e$  (37%) of the samples survive, and  $m$  is a parameter called the *Weibull modulus*. The greater the value of  $m$ , the steeper the transition from survival to failure.



To calculate the survival probability at a volume,  $v$ , that differs from the initial sample volume,  $v_0$ , the expression is

$$\phi(v) = \exp\left\{-\frac{v}{v_0}\left(\frac{\sigma}{\sigma_0}\right)^m\right\},$$