1. Reliability and Reliability Index

For a stress safe condition in terms of the difference between the yield stress, and the stress, under the given load, the condition that indicates a safe design. The probability of failure, is defined as the chance that ;

where and are the mean and the standard deviation of *Z*. Similarly, and are the mean and the standard deviation of the yielding stress and and are those for the applied stress. More, is the CDF ( Cumulative Distribution Function ) of a normal distribution. Based upon these definition, one has

For a safe design, one may set a threshold of the reliability , which is defined as the probability of non-failure, or

The corresponding value of is called the reliability index, ,which is then given by

For example, , the reliability is 99.5% and , the reliability is 97.5%. ( Pareto front points in Figures 8 show high reliability ).

1. Peak Stress and Reliability

For any particular stress, say a peak stress , one can calculate the corresponding reliability. Set . The probability of failure is given by

or the associated reliability is given by

Note that and .

1. It is notice that if the peak stress is higher than the mean stress for a given design, i.e.,, it leads to . Since

.

where is set to achieve the pre-determined reliability

(1)

The corresponding design has lower reliability.

1. If the peak stress is lower than the mean stress for a given design, i.e.,, it leads to . Since

.

The corresponding design has lower reliability.

1. Peak Stress and Applied Stress

One may need to investigate the question whether the design is safe if the stress condition

is less than the peak stress

or

Set (2)

**Actions:**

Calculate and Report and for each Pareto Front design point, regardless whether it is from ALHS method or Stochastic Load Method. and are the mean and the standard deviation of all possible stresses due to uncertain loads.

Equation (1) can help ALHS method to find the reliability of the design and Equation (2) to help both approaches to find the possibility that the stress is lower than the peak stress.