where:

K_I = Stress intensity
σ = Stress
a = Flaw depth
Q = Shape factor, Q = 1 for long flaws with respect to depth (length/depth ≥20).

The time to failure of a glass structural element (static fatigue life) is found by:

$$t = \left(\frac{2Q}{1.21 \cdot \pi \sigma^2} \right) \cdot \int_{K_{I_i}}^{K_{IC}} \left(\frac{K_I}{v} \right) dK_I \qquad \text{(Eq. 3)}$$

where:

K_I = Stress intensity
K_{IC} = Critical stress intensity
σ = Stress
Q = Shape factor, Q = 1 for long flaws with respect to depth (length/depth ≥20)
v = Flaw growth velocity.

f. Equation 3 shall be used to establish the static life of a glass or ceramic component.

g. Material parameters for each material used shall be determined by test in the environment established for windowpane design.

h. The equation for K_I (equation 2) shall be appropriate for the configuration that is analyzed.

4.7.5 Material Data Scatter and Average Flaw Growth Properties

a. Each windowpane shall be designed using average flaw growth properties (K_I versus velocity) and four times the required design life to account for scatter in the flaw growth data.

b. The K_{IC} used to determine failure shall be based on the average inert K_{IC} minus three standard deviations of the K_{IC} as determined by analysis of the material test data developed in accordance with ASTM C1421, Standard Test Methods for Determination of Fracture Toughness of Advanced Ceramics at Ambient Temperature, or as provided in NASGRO®.

c. NASA Technical Authority approval shall be obtained for the number of test samples required to establish K_{IC}.

The flaw growth properties contained in NASGRO® may be used, if available.