\[ G_2 = \frac{2}{35} \sqrt{2\phi} \pi - \frac{1}{6} Y_0 + Y_1 \]
\[ G_3 = \frac{52}{525} \sqrt{2\phi} \pi - \frac{1}{5} Y_0 + \frac{9}{10} Y_1 \]
\[ G_4 = \frac{316}{2,475} \sqrt{2\phi} \pi - \frac{1}{5} Y_0 + \frac{4}{5} Y_1 \]

where \( Y_0 \) and \( Y_1 \) are the solution functions given in A-3500 for the appropriate flaw model and geometry for the component, and \( \phi \) is defined in A-3311. When the calculated value for a \( G_i \) coefficient is less than 0, the \( G_i \) coefficient shall be set to zero for calculating \( K_i \).

(b) For the surface point (Point 2), \( G_i \) shall be determined from the following equations:
\[ G_0 = F_0 \]
\[ G_1 = F_1 \]
\[ G_2 = \frac{4}{105} \sqrt{\phi} \pi - \frac{1}{14} F_0 + \frac{5}{7} F_1 \]
\[ G_3 = \frac{4}{105} \sqrt{\phi} \pi - \frac{1}{15} F_0 + \frac{1}{2} F_1 \]
\[ G_4 = \frac{16}{495} \sqrt{\phi} \pi - \frac{3}{55} F_0 + \frac{4}{11} F_1 \]

where \( F_0 \) and \( F_1 \) are the solution functions given in A-3500 for the appropriate flaw model and geometry for the component, and \( \phi \) is defined in A-3311. When the calculated value for a \( G_i \) coefficient is less than 0, the \( G_i \) coefficient shall be set to zero for calculating \( K_i \).

**Mandatory Appendix A-3420**

**K_i Based on Weight Function Method**

For an arbitrary stress distribution \( \sigma(x) \) on crack face, the stress intensity factor is given by the following equation using the weight function method:

\[ K_i = \int_0^d m(x,a)\sigma(x)dx \quad (9) \]

where
- \( a \) = crack depth
- \( K_i \) = stress intensity factor
- \( m(x,a) \) = Mode I weight function
- \( x \) = distance from the surface and moving positive toward the tip of the surface crack, defined in Figure A-3210-1
- \( \sigma(x) \) = stress distribution normal to the plane of the flaw

**A-3421 K_i Equations Based on Weight Functions**

(a) For the deepest point (Point 1) of a semielliptical surface crack as shown in Figure A-3100-1, illustration (b), the weight function is given by

\[ m(x,a) = \frac{2}{[2x(a-x)]^{1/2}} \left[ 1 + M_1 \left( 1 - \frac{x}{a} \right)^{1/2} + M_2 \left( 1 - \frac{x}{a} \right) + M_3 \left( 1 - \frac{x}{a} \right)^{3/2} \right] \]

where the weight function coefficients \( M_i \) are dependent on geometry of the structure and crack dimensions. The stress intensity factor calculated using A-3420 eq. (9) and the piecewise linear stress distribution of A-3221 eq. (3) is given by