Title: MEASURING RESIDUAL STRESS EFFECTS IN CT SPECIMENS

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• Following the derivation in [1,2] The $K_I$ from the release of all residual stresses up to $a$ is given by:

$$K_{irs}(a) = \frac{E'}{2B} \frac{d(CMOD)}{da}$$

• A $K_{IF}$ solution of sufficient accuracy is given in [3] as:

$$\frac{BK_{IF}(a)}{F} = \frac{2.5934 - 3.625a + 32.5162a^2 - 76.1035a^3 + 117.4162a^4 - 108.706a^5 + 54.3705a^6 - 11.4149a^7}{(1-a)^{\frac{3}{2}} \sqrt{a^3 W}}$$

$$\tilde{a} = a + \frac{0.25W}{1.25W}, \tilde{W} = 1.25W$$

• Measurement of height $h$ works also:

$$\frac{dh}{da} \approx \frac{d(CMOD)}{da}$$

• However using change in $h$ before and after making slot can potentially even give the wrong sign for $K_{irs}$

$$-\frac{d(CMOD)}{da} \Rightarrow -K_{irs} \quad \text{correct}$$

$$+\Delta h \Rightarrow +K_{irs} \quad \text{wrong}$$

Because of the equilibrium condition, this curve will always inflect at some point and give a change in the sign of the slope.