Stress Risers--How to handle with fatigue loading

Fully Reversed Loadings:

Find the theoretical stress concentration factor, K_t

Geometry
Loading Mode

Find the notch Sensitivity, q
material
notch dimension

Calculate K_f

multiply σa by K_f

Plot information on Goodman Diagram as usual

Fluctuating Loadings:

Treat σa the same way as fully reversed (i.e., multiply it by Kf)

If the material is **brittle**: multiply σm_{nom} by the **full value of Kt**

If the material is **ductile**:

now call Kf -- Kfm

$$if\ K_f\left|s_{\max_{nom}}\right| < S_y \qquad K_{fm} = K_f$$

$$if\ K_f\left|s_{\max_{nom}}\right| > S_y \qquad K_{fm} = \frac{S_y - K_f s_{a_{nom}}}{\left|s_{m_{nom}}\right|}$$

$$if\ K_f\left|s_{\max_{nom}} - s_{\min_{nom}}\right| < S_y \qquad K_{fm} = 0$$

Given the following information, determine the factors of safety for the machine component given below:

D = 1.125 inches
d = 1.0 inches
b = 2.00 inches
l = 6.0 inches
r = 0.5 inches
a = 5.00 inches

F_{max} = 1100 lb
F_{min} = 100 lb.

Material is SAE 1040 normalized steel--S_{ut} = 80 kpsi, S_y = 60 kpsi
Surface is machined.
Reliability = 99.9%