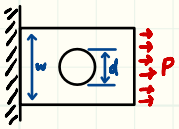
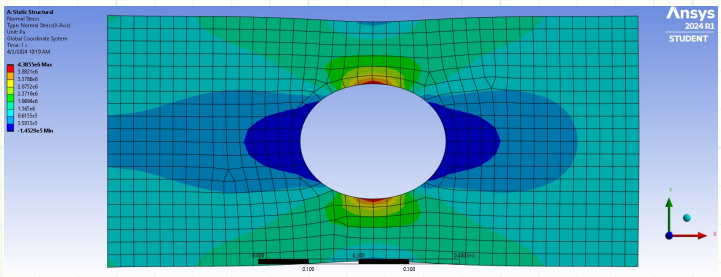
a) $K = \frac{\sigma_{act}}{\sigma}$ $\quad \sigma = \frac{F}{A} = \frac{Pw}{(w-d)t}$

$$K = \frac{\sigma_{act}(w-d)}{Pw} = \frac{\sigma_{act}}{P}\left(1 - \frac{d}{w}\right)$$

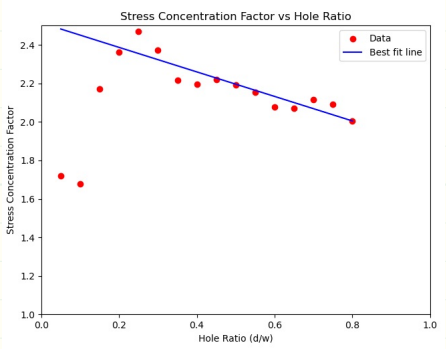



$\frac{d}{w} = 1/2$




| $\frac{d}{w}$ | $\sigma_{act}$ (MPa) | K |
|---|---|---|
| .05 | 1.8086 | 1.71817 |
| .10 | 1.8634 | 1.67786 |
| .15 | 2.6541 | 2.170985 |
| .20 | 2.9519 | 2.36152 |
| .25 | 3.2942 | 2.47065 |
| .30 | 3.3876 | 2.37132 |
| .35 | 3.4115 | 2.2174175 |
| .40 | 3.6597 | 2.19582 |
| .45 | 4.0372 | 2.22046 |
| .50 | 4.3855 | 2.19275 |
| .55 | 4.7864 | 2.15388 |
| .60 | 5.1957 | 2.07828 |
| .65 | 5.9162 | 2.07067 |
| .70 | 7.0512 | 2.11536 |
| .75 | 8.369 | 2.09225 |
| .80 | 10.0237 | 2.00054 |

Plot:




Excluding the first 3 points (mesh was likely too large), the best-fit line is:

$$K = 2.51422 - 0.63677\left(\frac{d}{w}\right)$$

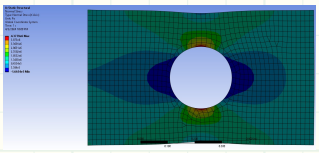
b) i.

| Mesh size (m) | Max Stress (MPa) | K |
|---|---|---|
| 0.002 | 4.38779 | 2.19389 |
| 0.025 | 4.3855 | 2.19275 |
| 0.030 | 4.2134 | 2.1067 |

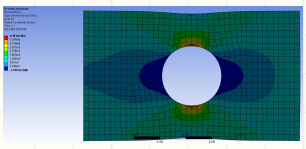
ii.

| Poisson's ratio | Max Stress (MPa) | K |
|---|---|---|
| 0.25 | 4.383 | 2.1915 |
| 0.3 | 4.3855 | 2.19275 |
| 0.35 | 4.3879 | 2.19395 |

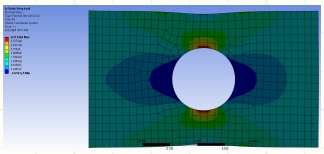
Mesh size: 0.002 m



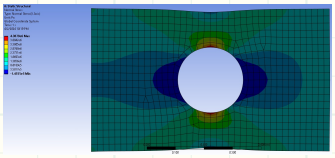
Poisson's ratio: 0.25



Mesh size: 0.03 m



Poisson's ratio: 0.35



Smaller mesh size/bigger mesh density increases the max stress & thus stress concentration as smaller element take more local values

Poisson's ratio is negligible since the major stress contribution is axial, not from poisson effects