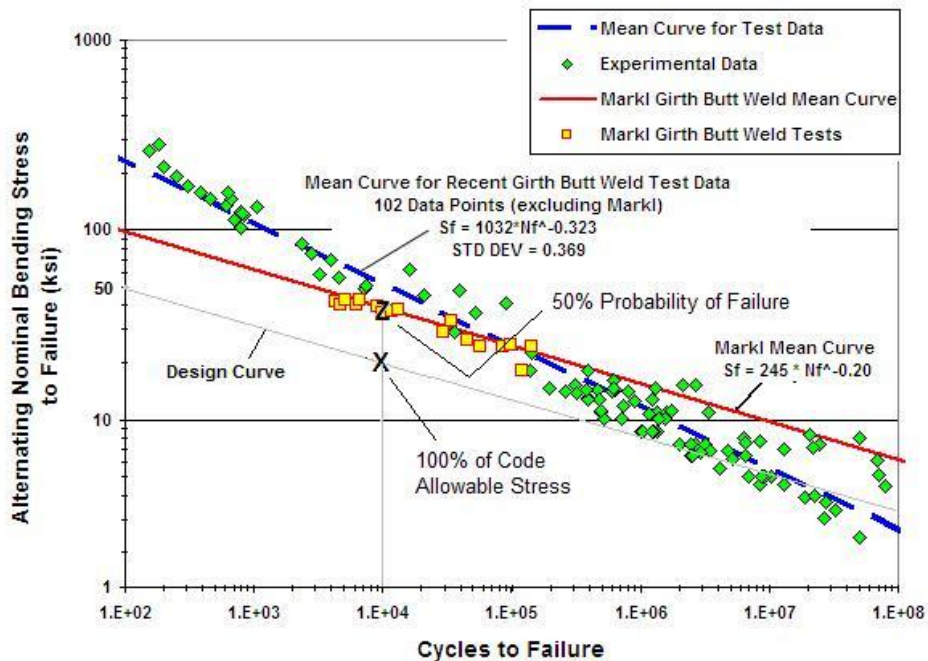# What if the SIF is Not Accurate?

The figure below shows an X at 100% of a typical allowable stress and a Z at the mean of the failure data. The ratio between Z and X is the "safety" when the design is at 100% of the allowable stress. For fatigue, the ratio between Z and X is about 2.0.

If the SIF is off by 2.0 and the ratio between design and mean failure is 2.0, then at 100% of the Code allowable stress there is no safety factor.

The design stress is a product of the calculated load and the SIF.

If the calculated load is off by more than 2.0 and the ratio between design and mean failure is 2.0, then at 100% of the allowable stress, there is more than a 50% probability the component will develop a crack during its lifetime.

Some Calculated SIFs are compared below to B31 Code SIFs from Appendix D for large diameter 90 and 60 degree large diameter intersections with d/D = 1 and 0.4. Differences can be seen to be both conservative and non-conservative by a factor of about 2.0

Unreinforced Fabricated Tee

Description	Angle	ii (B31.3)	io (B31.3)	ii (FEA)	ii (FEA)
30x30x0.375	90	8.079	10.439	10.63	13.75
30x12x0.375	90	8.079	10.439	4.56	13.22
30x30x0.375	60	8.079	10.439	9.23	10.9
30x12x0.375	60	8.079	10.439	4.64	11.07

Fabricated Tee With 0.25 inch Reinforcing Pad

Description	Angle	ii (B31.3)	io (B31.3)	ii (FEA)	ii (FEA)
30x30x0.375	90	5.1	6.46	6.82	12.32
30x12x0.375	90	5.1	6.46	3.98	11.09
30x30x0.375	60	5.1	6.46	6.22	10.87
30x12x0.375	60	5.1	6.46	4.07	9.54
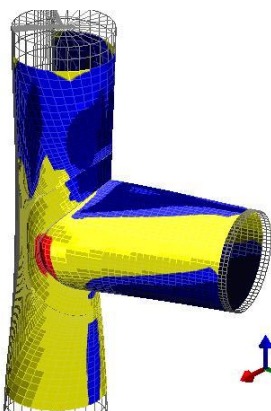
Note that for laterals and hillside junctions torsional moments may interact with inplane and outplane moments to produce situations where the calculated and B31 SIF factors are different by much greater than 2.0.

In these situations users are urged to use additional caution.