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Stress Intensification Factor (SIF) Checklist

Generally, as a piping designer and engineer, you need to be concerned about accurate stress intensification factors (SIFs) in certain combinations of situations:

1. A leak of the contained media poses a significant hazard.
2. When using the current rules, calculated stresses at intersections are more than 40% of the allowable.
3. The number of design cycles is greater than 1000.
4. The process fluids are heavily corrosive.
5. When the branch diameter to header diameter (d/D) ratio is less than 0.5 SIFs used from B31 codes can be overly conservative.
6. There is significant pressure cycling combined with external load cycling.
7. Single sided weld quality may be poor.
8. Reinforcing pads and unreinforced, welded intersections are used instead of welding tees.
9. Laterals or hillsides are used where the header diameter to thickness (D/T) ratio is greater than 50.

The use of improved SIFs AND flexibilities should always be compared to original models, and where the original model is more conservative, you should be sure that the more accurate solution is validated.

Pipe Stress Checklist

1. Identify if the system contains a media that poses a significant leakage hazard, is subject to more than 1000 operating cycles, or is heavily corrosive.
2. Run the standard CAESAR II® model and note intersections where the stresses are more than 40% of the allowable.
3. If the branch to header diameter (d/D) ratio at the intersection is less than 0.5 then loads through the header will not be accurately predicted by CAESAR II. An improved and reduced SIF may often be found.
4. You should be cautious where laterals are highly stressed. Torsional moments on laterals resulting from movement of the header can cause high stresses in laterals and some hillside connections.
5. If high stressed intersections are identified, run FESIF and compare FESIF calculated SIFs to the values used in the B31 codes. This comparison is done in the FESIF SIF report. If the FESIF values are significantly larger, then consider improving model.
6. Run the FESIF *load reduction* calculator. If the load reduction on the intersection could be greater than 50%, then consider using the stiffnesses in the CAESAR II model.
7. The FESIF *load reduction* calculator also works where intersections are in the vicinity of rotating equipment, and may provide guidance for resolving rotating equipment problems.
8. Depending on the extent and criticality of the overstressed condition, use either the simple method or the stiffness method to improve selected intersections in the

system. This might often be less difficult than rerouting major piping systems that do not need to be rerouted.

9. SIFs can be generated for the branch side attached pipe or for the header (run) side attached pipe.

Extra precaution should be exercised when WRC107 is used for an intersection analysis with pad reinforcement. Reinforcing pads on intersections will often force high stresses into nozzle necks.

Including stiffnesses does not necessarily make an analysis more or less conservative. Including stiffnesses at one intersection will drop the loads at one intersection while transferring it to another. The right intersection stiffnesses give the correct answer. Not using intersection stiffnesses give you a less accurate answer that may, or may not be conservative for the system as a whole.