



Key Design Engineering

Discussion: Finite Element Analysis (FEA) in a CRN Submission

The jurisdictions' stated purpose is to ensure the safety of the design. In practical terms, this means code compliance. Traditionally, some of the driving motivations for FEA could be: reducing prototyping costs, shortening the time-to-production, and ultimately resolving complex design challenges. However, in the present case, the focus is product safety by ensuring code compliance and it can be quite baffling for experienced finite element analysts to have their submitted reports rejected by the Jurisdictions. Experience has shown that there are a few reasons for this:

- **FEA cannot be used to replace Code calculations:** Whenever possible, classical calculations from the relevant Code will be mandated. Some mistakenly run FEA when the classical calculations fail. Not only will this rarely yield acceptable stress levels, but the Reviewer will also reject this approach. FEA can only be used to either,
 - a) Bridge a gap in the Code, or
 - b) Calculate an unusual configuration that is clearly outside of the scope of the relevant Code's standard layouts.
- **FEA must be interpreted per ASME VIII-2 rules:** The acceptable stress levels for different components, transitions, and stress categories are mandated in ASME VIII-2. General statements, such as a general 2 or 3 times factor of safety to UTS or Yield, are not acceptable.
- **Model setup must satisfy intent of the Code:** The model setup options, such as loadings and boundary conditions, must be consistent with the conservative intent of the Code. This concept is reinforced by ASME VIII-1, U-2(g).
- **Report presentation and format is inadequate:** ABSA has itemized their report requirements and other jurisdictions are accepting this document as being a reasonable guide. Essentially, it addresses some of the deficiencies noted above and covers three main areas: Executive Summary, Setup Options, and Interpretation of Results. Successful submissions must comply with these requirements.

Please contact Key Design Engineering for further information.

1. See document entitled "ABSA FEA Requirements" in the *Helpful Articles* section:
www.keydesigneng.com/ABSA_FEA_Req.pdf