## Released January 2021

# FEATOOIS v15.0

FEATools v15.0 transforms your piping model (CAESAR II and PCL-Gold) by including upgraded branch connections (with the addition of rigid elements and restraints) to better simulate realworld displacement and forces. The FEA-based calculations provide the necessary k-factors, SSIs and SIFs that will be added to every branch connection.



#### FEATools v15.0 New Features

ASME 2019 Code Compliance Pipe Shoe Design Wizard - PIP Shoe Library Added

Automated Nonlinear SSI and Collapse Calculations for Bends & Branches

ASME Code Classification Update

**Updated Bends with Trunnion Models** 

Collapse Load Model Perturbation and Buckling for Cylinders, Bends & Branch Connections

+Y Simple Nonlinear Supports for Pipe Shoes & Similar Geometries

Flange Automated Evaluation Wizard (Condense)

FEATools v15.0 is included with FEPipe v15.0

## ASME B31J - 2017 Code Changes

The goal of the B31J code changes is to improve the accuracy of the calculation of SIFs, SSIs and k-factors for specific types of piping components and geometries. For some types of intersections, the new k-factor can easily be 2 to 8 times the old k-factor. These updated calculations have been provided as written formulas and tables which can be cumbersome and time-consuming to use.

FEATools automates the process of applying B31J to your entire CAESAR II model without requiring the user to be an FEA expert. Geometries that lie outside of the B31J code limits can still be analyzed and more accurate results achieved by using FEATools.

#### Easy to Use

- STEP 1 Run the piping model file (CAESAR II or PCL-Gold) thru FEATools to generate FEA-based SIFs, SSIs & k-factors.
- STEP 2 Re-run your piping model file (CAESAR II or PCL-Gold) analysis to get more accurate stresses, loads, displacements and life cycles.

## Which components are better analyzed with FEATools?



**B31 Branch Connections** 



**Pipe Shoes** 



Bends with Trunions & Supports



Rectangular Head Connections (Stiffnesses & SIFs only)



Vessel, Pump & Tank Connections



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# FEATOOIS v15.0 includes the following Programs...

| ) | Piping FEA Translator    | Translates and updates complete CAESAR II or PCL-Gold models to include more applicable data for all B31J and FEA components. Includes options for laterals, hillsides, olets, various welding tees, vessel heads, cones, pipe shoes and API 661 rectangular duct nozzle connections. This entire process is automated - no node-by-node design is required. Will import any cii file version 6.1 to 12.0. Users may update all branch connections automatically or one at a time.                                  |
|---|--------------------------|---|
| 1 | Pipe Shoe Design Wizard  | Compares CAESAR II or PCL-Gold selected nodes' restraint loads at shoe support locations with the allowable loads from a library of FEA shoe supports for every load case in the piping model. The comparison provides shoe design capabilities as well as validation that existing shoes are appropriately designed.   |
|   | Criticality Evaluator    | Depending on the piping system's parameters, the Criticality Evaluator determines whether the piping system is a<br>critical piping system on which Finite Element Analysis should be used to determine the k-factors, SSIs and SIFs for the<br>branch connections.   |
|   | SIF / SSI / k (PRGik)    | Compares SIFs and k-factors from B31 and other codes for branch connections and elbows. Hyper Degree of Freedom (HyperDOF) calculations can be performed for elbows with and without supports with refractory.  |
|   | Flaw Detection           | Predicts crack growth for given stress states in components to know when the crack will reach half wall and/or thru wall for leaks. This is a quick calculation based on observed crack growth in tested low carbon steel components.   |
|   | Drawing Tools            | Available through FETee and FEBend, the Drawing Tools provide hundreds of small functions to modify, evaluate and document the model created.   |
|   | Flange Evaluation Wizard | CONDENSE Processor that automatically estimates and evaluates flange connections for fit-up tolerances and calcu-<br>lated sustained, operating and occasional loads. Determines the stresses caused due to bolt-up of the piping system<br>considering the gap and rotational tolerances.  |
|   | Cumulative Damage        | Performs fatigue analysis and cycle counting for piping systems that were built using CAESAR II or PCL-Gold. This tool should be used whenever cycles are outside limits; fatigue should be considered in the piping system; known fluid loading produces high cycle forces; cracks or local thin areas are present; multiple significant thermal and/or pressure cycle is present.   |
|   | FESIF                    | Calculates SIFs and k-factors for standard B31 branch connection geometries.  |
|   | FETee                    | FEA of contoured tees per user input, B16.9 or EN10253 is conducted. EN10253 types A and B tees can be defined and thickness profiles determined and appropriate finite element models constructed. Elastic models to produce SIFs and k-factors are generated automatically, along with nonlinear calculations (with or without pressure) for SSIs and loads thru the branch or run. Users may locally thin tees, define the crotch radius and/or the thickness profile around the branch to run penetration line. |
|   | FEBend                   | FEA calculation of the local stress and SIFs, SSIs and k-factors for 90 deg. elbows with and without supports. Supports include round stanchion as well as structural attachments.  |



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