

**PIPE STRESS ANALYSIS  
CAESAR II**



## CAESAR II®

# THE WORLD'S MOST RESPECTED TOOL FOR PIPE STRESS ANALYSIS

### Capabilities:

- Static Analysis
- Dynamic Analysis
- Intuitive Analysis Model Creation
- Design Tools and Wizards
- Load and View Plant Model
- Comprehensive Error Checking
- User-Definable Reports
- Wind and Wave Analysis
- Seismic and Support Settlement Analysis
- 35 International Piping Codes
- Extensive Material Databases
- Steel Databases and Modeling
- Expansion Joint Databases
- Hanger Design and Databases
- Automated Stress Isometric Creation
- Integrates with Intergraph Smart®, and CADWorx® Plant Design Suite
- Results Export to Microsoft® Excel®, Word, and MDB Files

### Expedited Piping Input

Experience improved usability in CAESAR II List Input dialogs with valuable performance improvements and a new Search and Replace capability that lets you make quick global changes to your models. Use convenient right-click menus to perform model actions in half the time.

### Enhanced 3D Model Display and Graphics

Large-scale improvements to the CAESAR II 3D model include new symbols for displacements, rotations, forces, and moments on the model. In addition, most graphic symbols display outside of the piping with an easy-to-read leader line. Node numbers and annotations display and rotate in front of all piping for complete visibility.

### Streamlined Load Case Editor

The redesigned Static Load Case Editor features a Group Edit view where you can select and change values to multiple load cases all at once. The enhanced List View offers easier scrolling and viewing options, as well as filtering on columns, drag-and-drop sorting, and Simpler manipulation of load cases.

You can select cases from the Static Load Case Editor for deletion, and instantly review the impacts to any related (combination) cases. CAESAR II automatically rennumbers load cases upon your deletion.

## Design Tools and Wizards

Tools and wizards for tasks (such as creating expansion loops or viewing plant models in the analysis space) help bridge the gap between knowledge and experience. CAESAR II takes the guesswork out of producing accurate analysis and recommending practical design changes.

## Nuclear Industry Compliance

CAESAR II complies with ASME NQA-1 quality assurance (QA). Subscribe to the CAESAR II QA and Reporting service to stay fully informed about issues and software changes. This notification service ensures that nuclear clients comply with U.S. federal requirements 10 CFR Part 50 App. B. and 10 CFR Part 21.

## Advanced Analysis and Reporting

Besides the evaluation of a piping system's response to thermal, deadweight, and pressure loads, CAESAR II analyzes the effects of wind, support settlement, seismic loads, and wave loads. Nonlinear effects, such as support lift-off, gap closure, and friction, are also included. Select the proper springs for supporting systems with large vertical deflections. Dynamic capabilities include modal, harmonic, response spectrum, and time history analysis. Quickly send analysis results to output reports or export to the file format of your choice (MDB, Excel, Word, etc.).

## Custom Nozzle Flexibilities

User-defined custom nozzle types let you use third-party tools to calculate nozzle stiffness values for axial, in-plane, out-of-plane, and torsional directions in the piping input. Custom flexibilities are useful for non-standard angled nozzles not addressed by existing nozzle code standards.

## Finite Element Analysis

Access third-party tools for finite element analysis from the CAESAR II main menu, including free access to the newly-published ASME B31J-2017 calculations for SIFs and K factors. Quickly send and translate through FEATools™, compare multiple file results, assess the sensitivity of model elements, and evaluate nozzle/branch connections with NozzlePRO™.

## Powerful Integration Capabilities

CAESAR II offers robust interfacing with CAD-based software, such as CADWorx Plant and Intergraph Smart® suites, using established industry formats (such as PCF and Isogen®). This lets you bring in data from other systems, carry it on to integrating solutions after analysis, and track support IDs throughout the system. With Intergraph Smart integration, you can view component identifier (GUID) information for restraints and hangers.

## Comprehensive Equipment Analysis

The fully-redesigned Equipment Manager for API 610 enables you to associate multiple load conditions with your pump and related nozzles. Experience the user-friendly interface and new comprehensive reports. Analysis capabilities are available for other equipment types with future plans to expand to the easy-to-use manager.

## Codes

- ASME B31.1, B31.9 (Power)
- ASME B31.3, w/ Ch. IX (Process)
- ASME B31.4, w/ Ch. XI (Pipeline) and Ch IX (Offshore)
- ASME B31.5 (Power)
- ASME B31.8 (Pipeline), w/ Ch. VIII (Offshore)
- ASME Section II, Class 2 and 3 (Nuclear)
- BS 806 (Process)
- JPI (Process)
- HPGSL (Process)
- CAN Z662 (Pipeline), w/ Ch. 11 (Offshore)
- CODETI (Process, Power)
- TBK 5-6 (Power)
- DNV (Offshore)
- EN 13480-1 (Power, Process)
- ISO 14692 (FRP)
- UKOOA and BS-7159 (FRP)
- PD 8010 Part 1 (Pipeline) Part 2 (Offshore)
- RCC-M C and D (Nuclear)
- Stoomwezen, Swed. Method 1 & 2 (Power)
- Equipment: API 560, 610, 661, 617, PD 5500, HEI, NEMA SM23, B31G, WRC 107/537/297, AISC
- Environmental: ASCE 7, NBC, IBC, UBC (Seismic & Wind), EN 1991 GB 50009, Mexico (Wind) NBR 6123, IS 875, BS 6399, As/Nzs 1170, KHK (HPGSL) L1 and L2 (Seismic)

# PIPE STRESS ANALYSIS - CAESAR II

## STATIC ANALYSIS

- Purpose of Pipe Stress Analysis - An Overview
- The Reasons for Pipe Stress Analysis
- Design Considerations for Pipe Stress Analysis
- Information Required for Pipe Stress Analysis
- What Information to be provided in Pipe Stress Analysis Report.

## PIPE FLEXIBILITY ANALYSIS PER ASME B31.3

- Pipe Stress Analysis Logic
- Minimum Flexibility Requirements
- Stress Range Reduction Factor -f
- Piping Flexibility – General Consideration
- Stress Analysis Flexibility Requirements
- Stress Analysis's Function
- Scope of Code Requirements

## STRESSES DUE TO SUSTAINED LOADS, STRESSES DUE TO DISPLACEMENT STRAINS AND STRESSES DUE TO OCCASIONAL LOADS

- Longitudinal Stress
- Longitudinal Stress from Pressure
- Longitudinal stress due to weight
- Allowable Displacement Stress range Basic  
Allowable Stress at maximum material temperature.

## HYDRAULIC DESIGN OF PIPING SYSTEMS

- Fluid flow sizing • Pipe sizing
- Reynolds number
- Types of flow in piping
- Pressure drop due to friction/ Viscosity
- Friction factor
- Moody diagram
- Minor losses in piping – Equivalent length method & Loss coefficient method
- Recommended velocities for Water and Steam piping

## PIPE DESIGN CALCULATIONS, MATERIALS, SIZE & WALL THICKNESS

- Design pressure & design temperature for piping systems
- Concept of pressure integrity
- Design pressure integrity, pipe size calculation
- Pipe wall thickness calculations
- Pressure design of miter bends
- Single & multiple miters
- Pressure design of blanks
- Branch reinforcement calculations

## STRESS ANALYSIS IN PIPING SYSTEMS

- Stresses in Piping Systems
- Failure Modes of Piping System
- Classification of Stresses in Piping System
- Theories of Failure
- Loads Present in Piping System & it's Combinations
- Support & Hanger Selection for Piping Systems
- Equipment Nozzle Load Qualifications
- Evaluation of local vessel stresses
- Making & Configuring Unit File for New Job
- Configuring Uniform Load for New Job.
- Piping Input Generation & Modeling
- Model Error Checking: Resolving Fatal Error & Warnings
- Running a Static Analysis
- Sustain & Expansion Stresses in Different Piping System Configuration.

## CAESAR II - STATIC ANALYSIS

- Static Output Review & Report Generation
- Stress Isometric Generation for Report
- 3D Plots Generation for Report
- Practical Examples – Input, Analysis & Redesign

## UNDERGROUND PIPE MODELING

- Buried Pipe modelling – Analysis and reports



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