ANSYS Mechanical Getting Started

Module 08: Reference Guide: Results and Validation

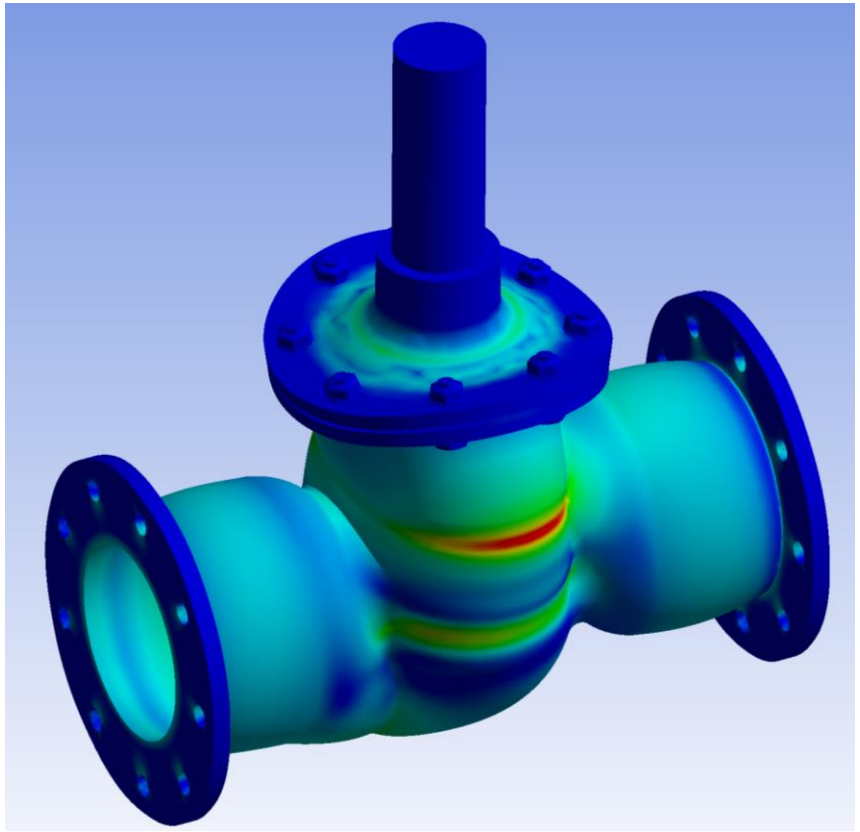
Release 2023 R1

Please note:

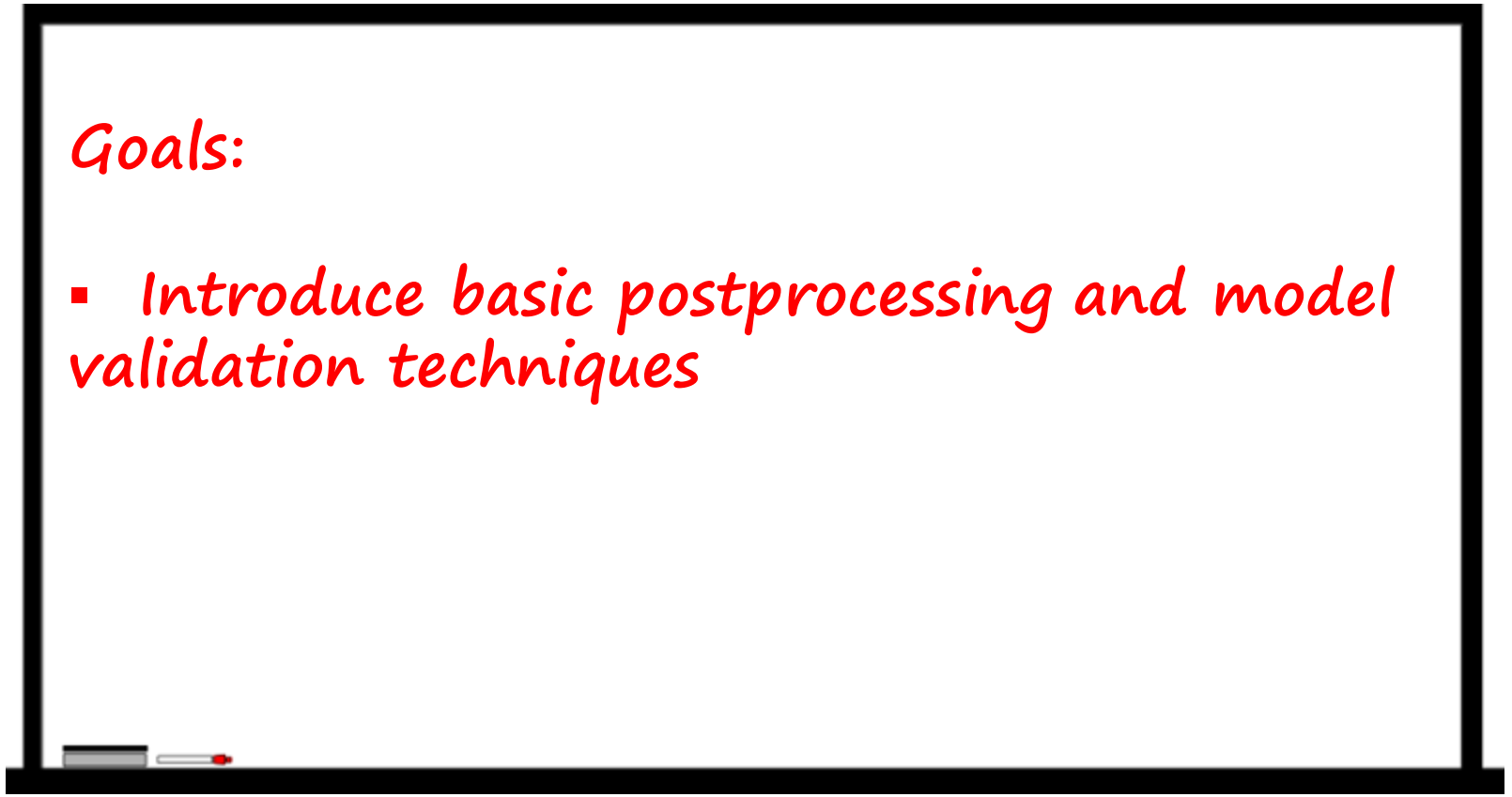
- These training materials were developed and tested in Ansys Release 2023 R1. Although they are expected to behave similarly in later releases, this has not been tested and is not guaranteed.
- The screen images included with these training materials may vary from the visual appearance of a local software session.

Module 08: Learning Objectives

- We'll conclude this module with a general understanding of the following:
  - How to use basic results quantities to validate the solution, including stress, deformation, reactions, and safety factors
  - How to use various postprocessing display controls for better visualization of results, including section views, animation, and contour adjustments
  - How to generate results that are independent of mesh density
  - How to summarize results for collaboration and sharing with others



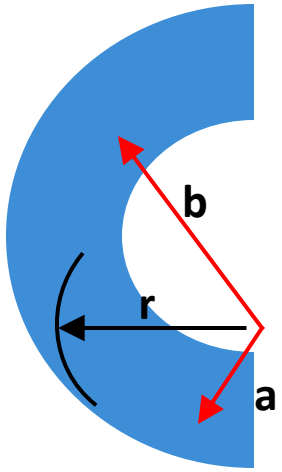
Module 08: Graphics



Module 08: Agenda

- Topics covered in the instructor demonstration:
  - Results definition and scoping (to the entire assembly, bodies, and/or faces)
  - Animation
  - Section views
  - Contour adjustments
  - Display types (deformation scaling, smooth/banded contours, show elements)
  - Probe Tool on Results toolbar
  - Reaction Solution
  - Component stresses compared against thick walled cylinder stresses using local cylindrical coordinate system
  - Stress Tool
  - Principal stresses
  - Convergence
  - Report generation

Module 08: Results and Validation (INSTRUCTOR ONLY)



$$\text{Tangential Stress}, \sigma_t = \frac{\boldsymbol{P_i}\, a^2}{b^2 - a^2}\left(1 + \frac{b^2}{r^2}\right)$$

$$\text{Radial Stress}, \sigma_r = \frac{\boldsymbol{P_i}\, a^2}{b^2 - a^2}\left(1 - \frac{b^2}{r^2}\right)$$

Stress in Thick-Walled Cylinder with Internal Pressure P_i

For the valve body:

- the inside radius, a = 32 mm
- The outside radius, b = 37.5 mm
- P_i = 7 MPa

Substituting into the above formulas, we can find the stresses on the inside (r = a) and outside (r = b) surfaces of the valve body as approximately:

- σ_{ta} = 44.5 MPa, σ_{tb} = 37.5 MPa
- σ_{ra} = 7 Mpa, σ_{rb} = 0 MPa

J. E. Shigley and L. D. Mitchell. Mechanical Engineering Design. McGraw – Hill. New York. 1983.

End of presentation