Module 08: Step-by-Step Guide:
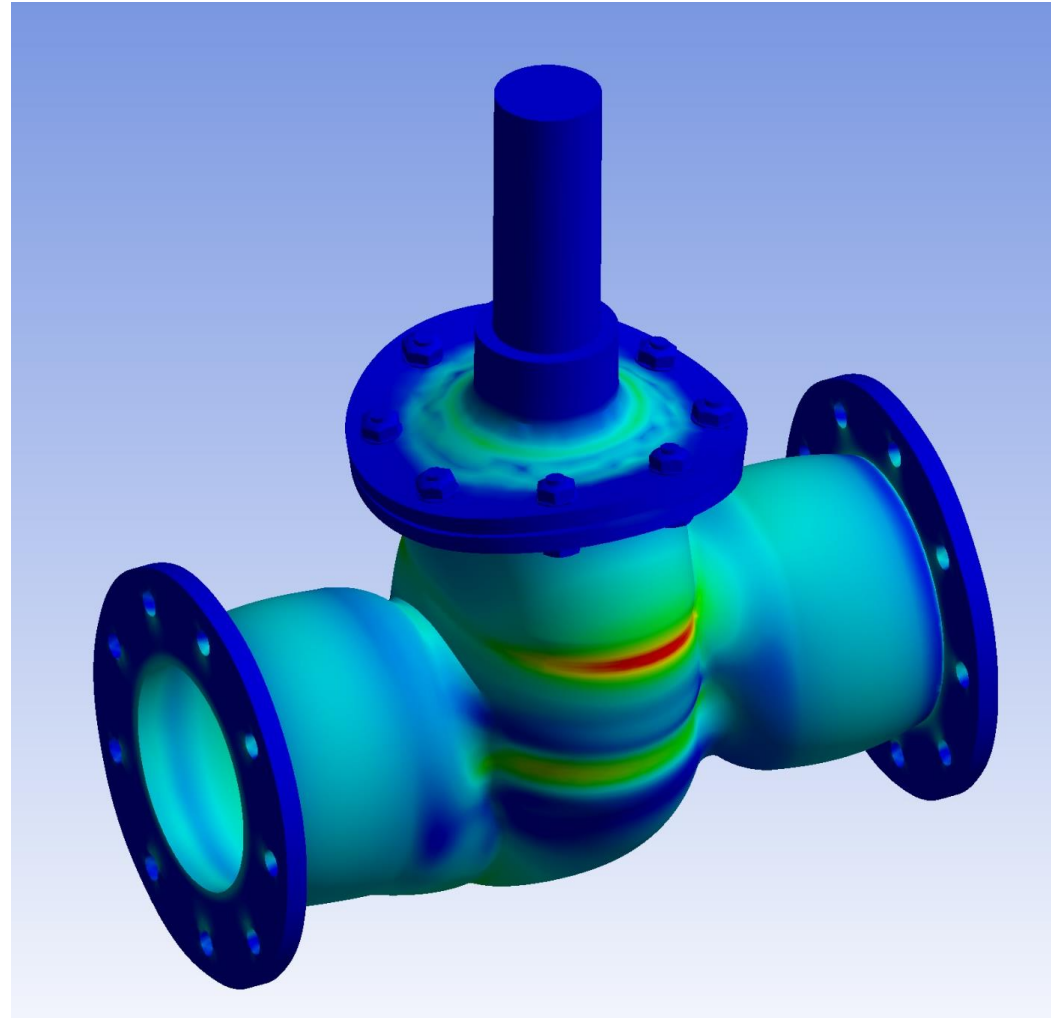# Results and Validation

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.
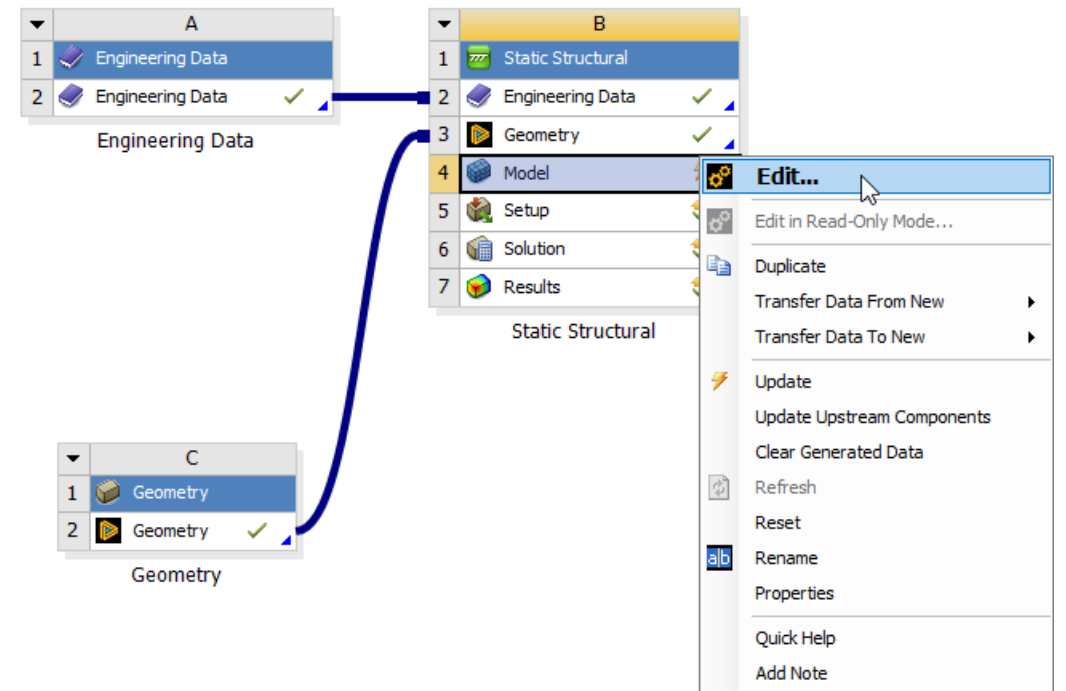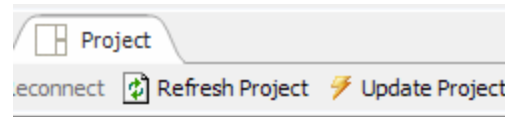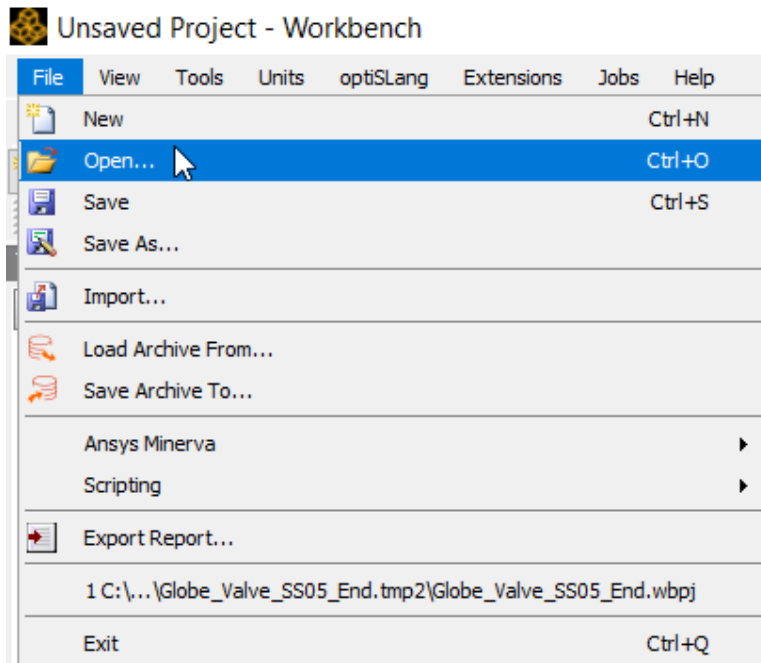
Ansys

Step-by-Step Guide 08: Results and Validation

Use this guide to repeat the steps the instructor demonstrated within this module.

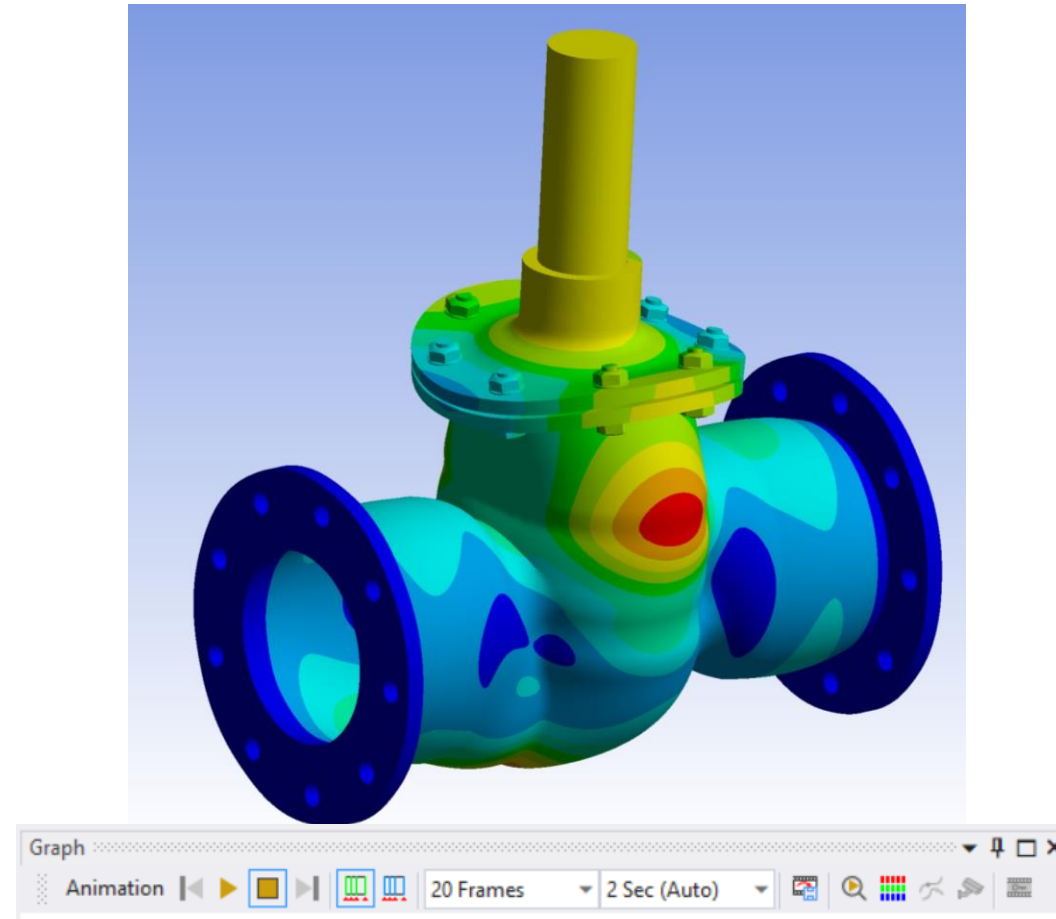# Step-by-Step Guide 08: Results and Validation

- Open **Archive** "Globe_Valve_SS08_Start.wbpz"

- **Update Project** in order to solve the model, then open Mechanical.

Step-by-Step Guide 08: Results and Validation

Review and animate the Total Deformation result:

- Select **Total Deformation**

- Click the Animation **"Play"** button in the **Animation** controller below the graphics window

Step-by-Step Guide 08: Results and Validation

Review Equivalent Stress result and add
Equivalent Stress results scoped to the Valve Body
and the Flange:

- Select **Equivalent Stress** and review the plot

- Select **Solution**

- Select **Valve Body** from graphics, **RMB → Insert → Stress → Equivalent**

- Select **Flange** from graphics, **RMB → Insert → Stress → Equivalent**

- **Evaluate All Results**

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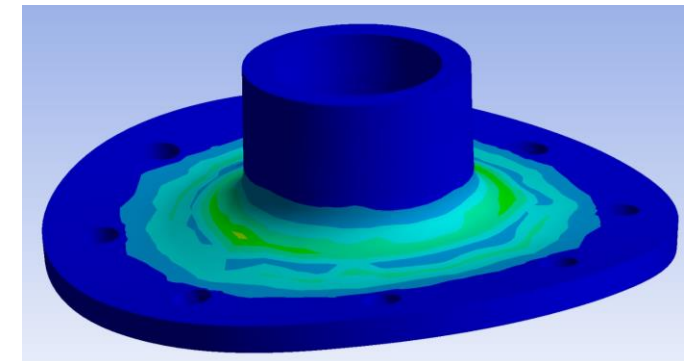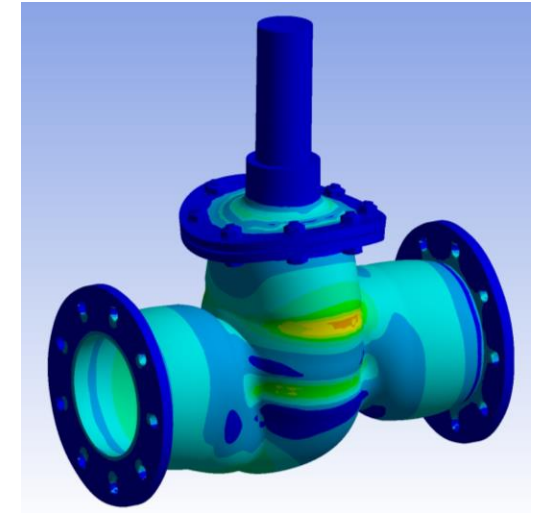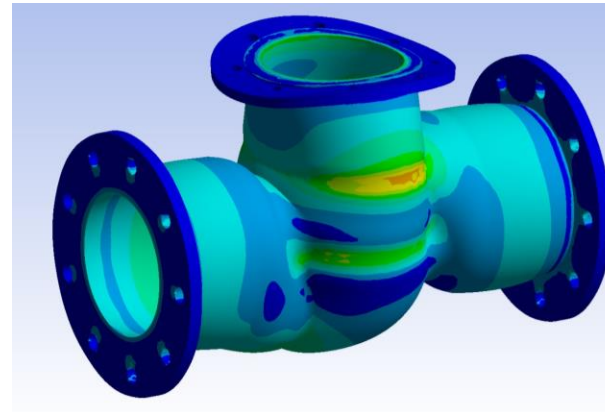
Step-by-Step Guide 08: Results and Validation

Adjust the contour scaling on the results plot:

- Select any stress result plot

- Click and drag a line on the contour legend separating two adjacent colors

- Define a contour legend value of **100** by **RMB →
Edit** on one of the existing contour values

- Add contour colors by clicking on the legend, then
+ / -

- **RMB** on **Contour Legend → Reset All**
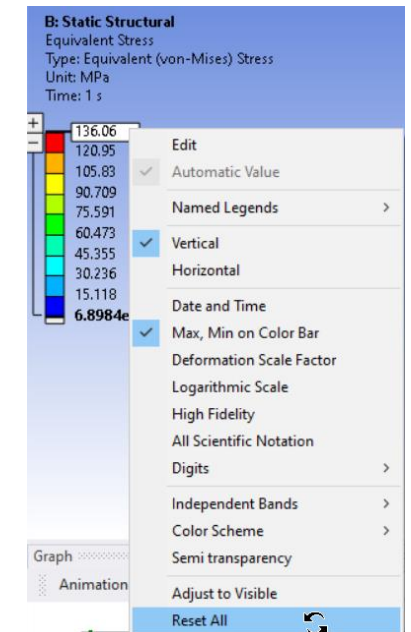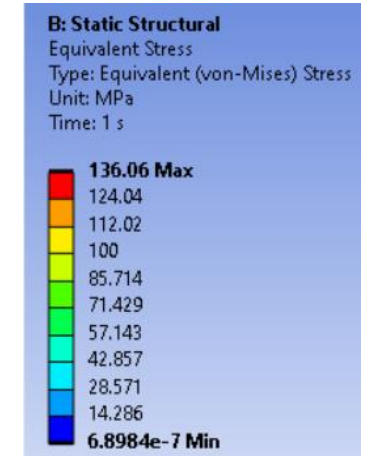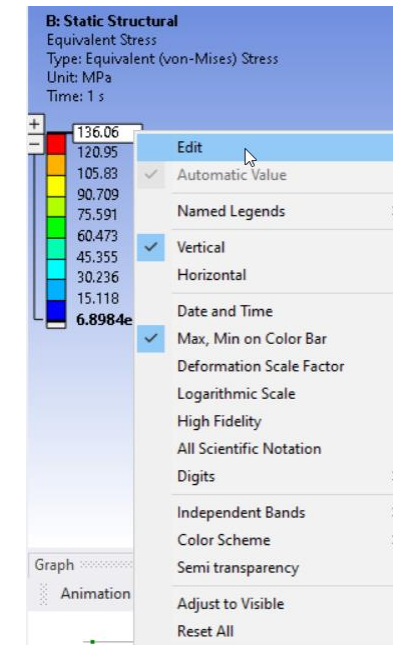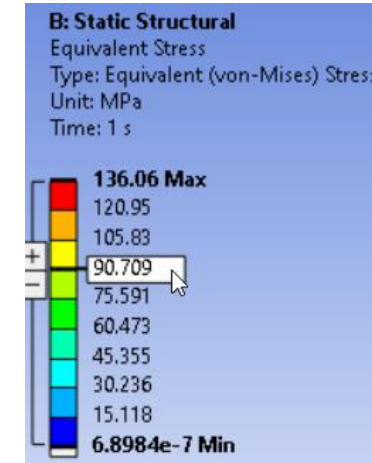
Step-by-Step Guide 08: Results and Validation

- Adjust Deformed Shape Scale, Compare Smooth/Banded Contours, Show mesh/undeformed geometry/wireframe on Contours:

- Select any stress result plot

- Adjust displacement scaling using **Result Toolbar**

- Toggle between **Smooth/Banded Contours**

- **Show Element** outlines, **Undeformed Geometry, Undeformed Wireframe**
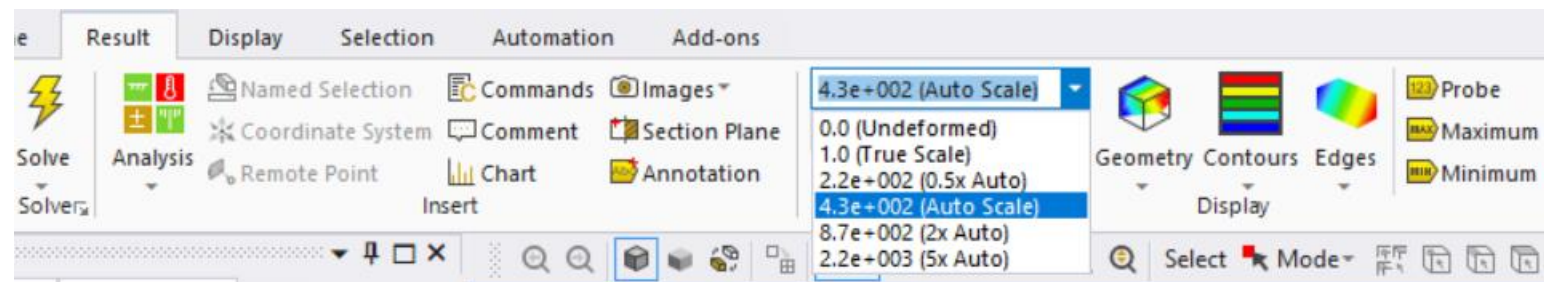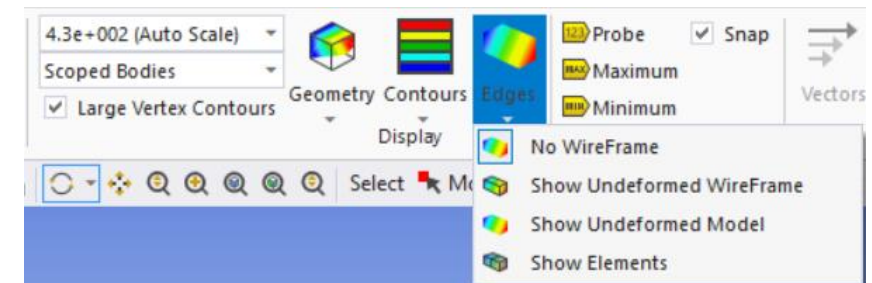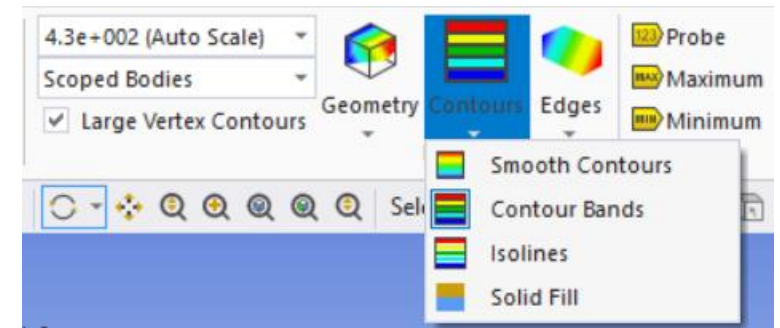
Step-by-Step Guide 08: Results and Validation

- Use a Probe to show numerical values on contour plot:

- Select any stress result plot

- Activate **Probe** using the Probe icon on the **Result Toolbar**

- Click desired location on contour plot

- **Delete All** Probe notations from the **Graphics Annotations** window
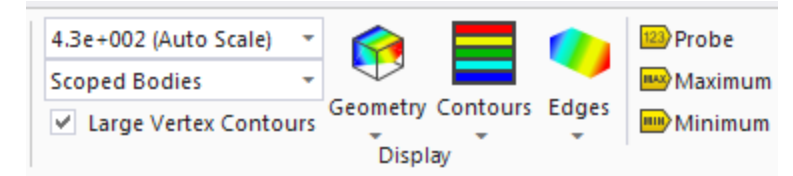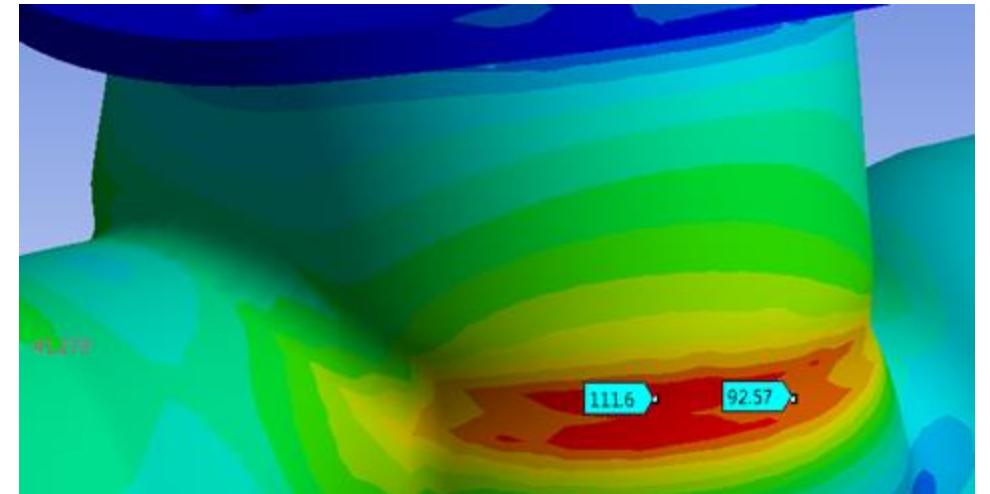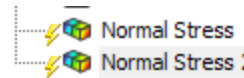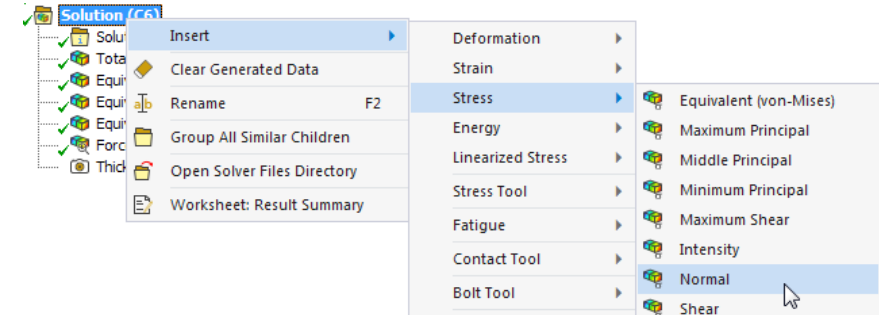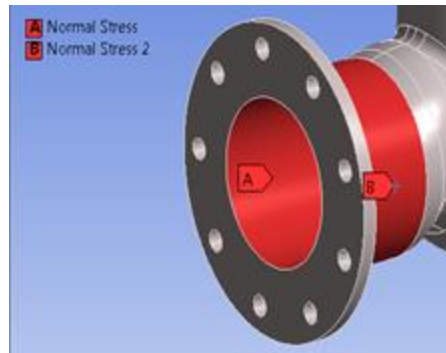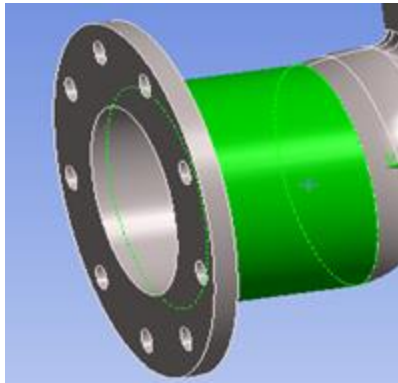
Step-by-Step Guide 08: Results and Validation

- Create Reaction Force results for each Frictionless Support boundary condition:

- **Drag/Drop** each **Frictionless Support** onto the **Solution** Branch

- **RMB → Evaluate All Results**

- Review each **Force Reaction** for magnitude and direction
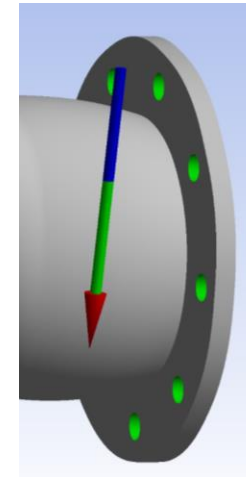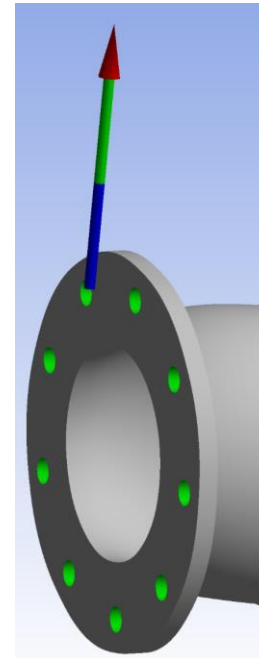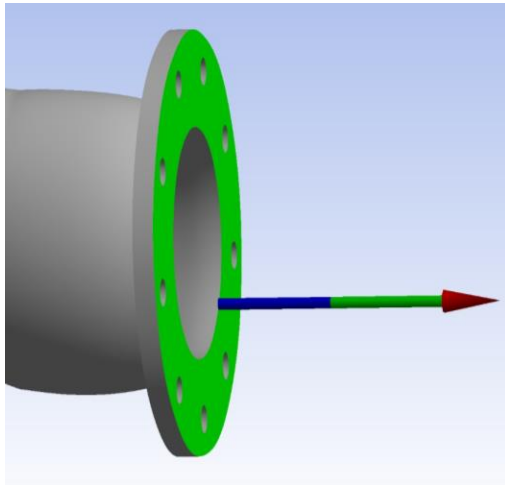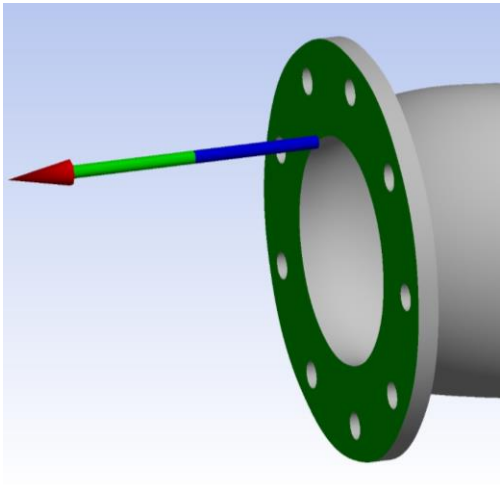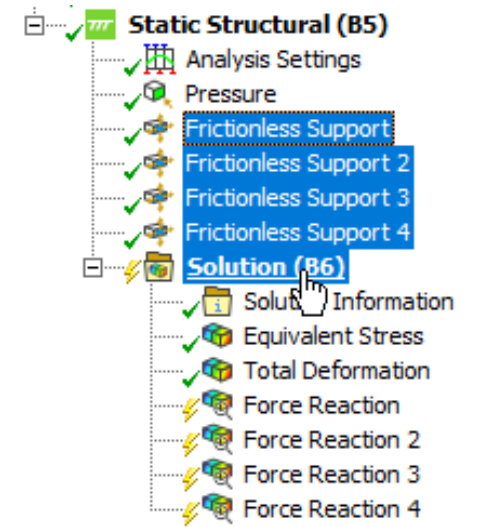
Step-by-Step Guide 08: Results and Validation

- Check radial and tangential stress in straight cylinder of Valve Body:

- Create **Normal Stress** results scoped to inside and outside surfaces of **Valve Body**

- Create local **cylindrical coordinate system** at outside surface of **Valve Body**

- Reference local coordinate system in **Details** of each **Normal Stress** result
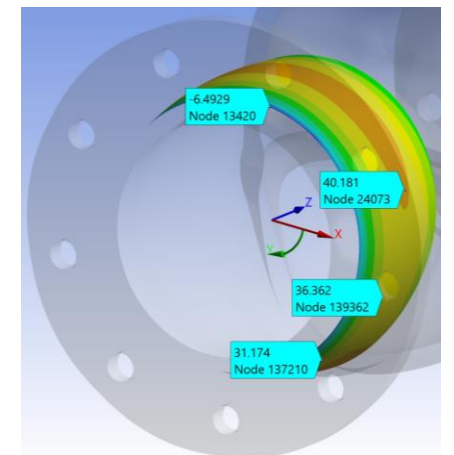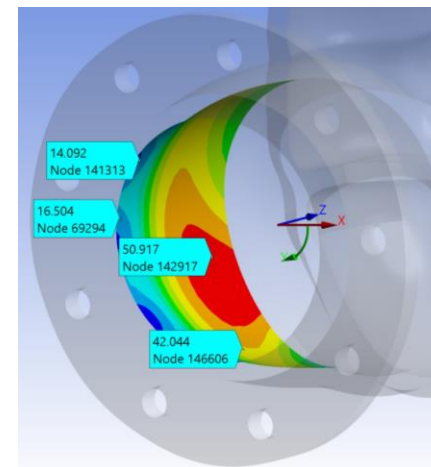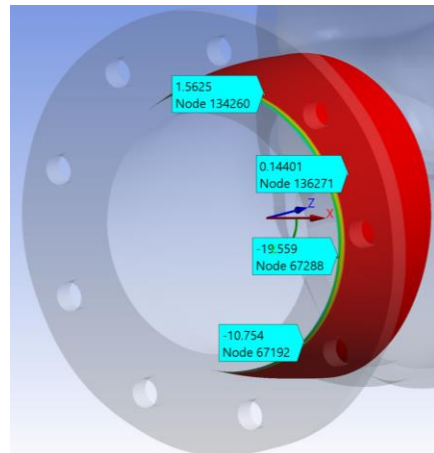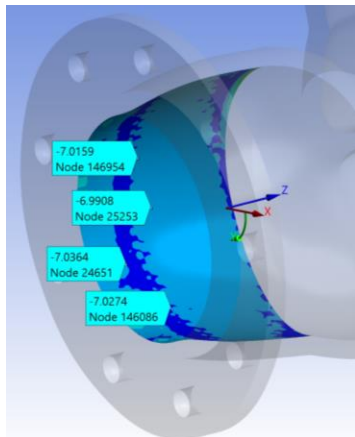
Step-by-Step Guide 08: Results and Validation

- Check radial and tangential stress in straight cylinder of Valve Body:

- **Evaluate All Results**

- Compare radial (X component) and tangential (Y component) stresses on inside/outside surfaces against theoretical values (Thick-Walled Cylinder Formulas Image) using **Probe**
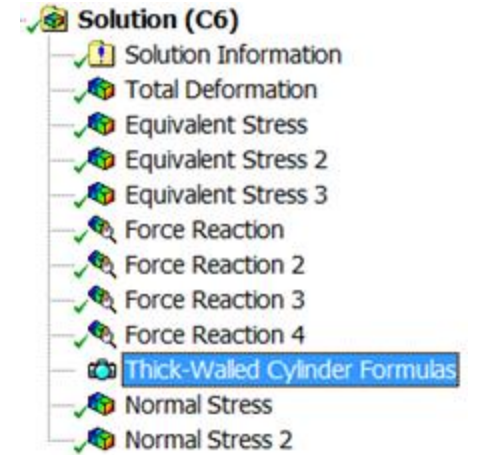
Step-by-Step Guide 08: Results and Validation

Use a Stress Tool to calculate safety factor against our design criteria:

- **Insert** a **Stress Tool** from the **Solution** Toolbar

- Change **Theory** to **"Mohr-Coulomb"**

- Change **Tensile Limit Type** to **"Custom"**

- Change **Compressive Limit Type** to **"Custom"**

- Use **147 MPa** as **Limits** (1/2 of 294 MPa Ultimate Strength)

- Change Scoping on **Safety Factor** Result to **Valve Body** part

- **Evaluate All Results**
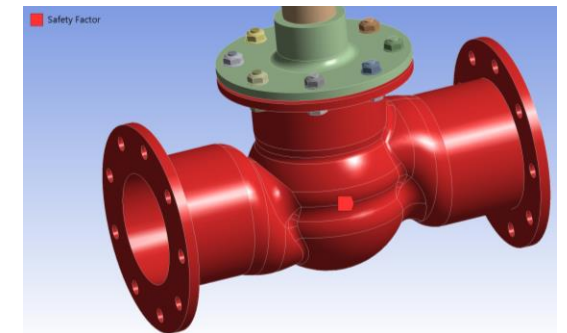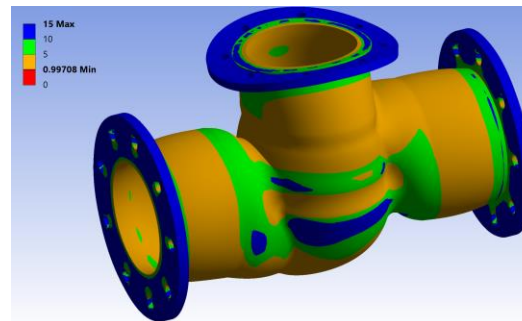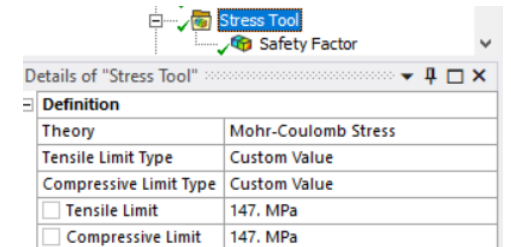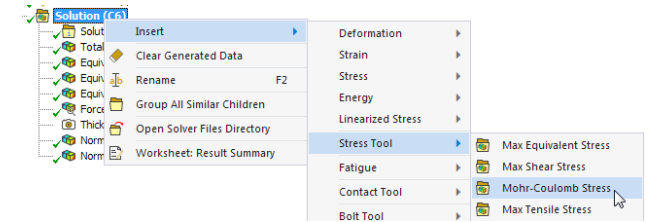
Step-by-Step Guide 08: Results and Validation

Add Principal Stress results to investigate stress distribution in critical areas of Valve Body:

- **Insert Max, Middle, and Min Principal Stress** results scoped to **Valve Body**
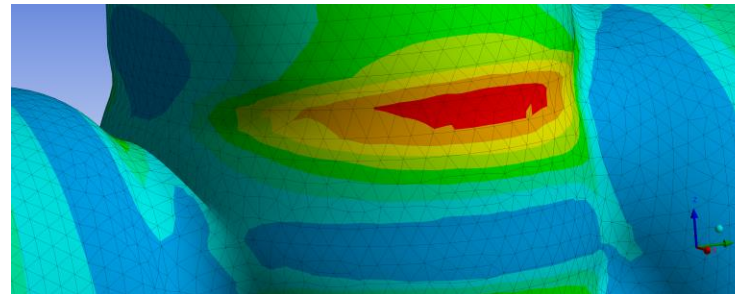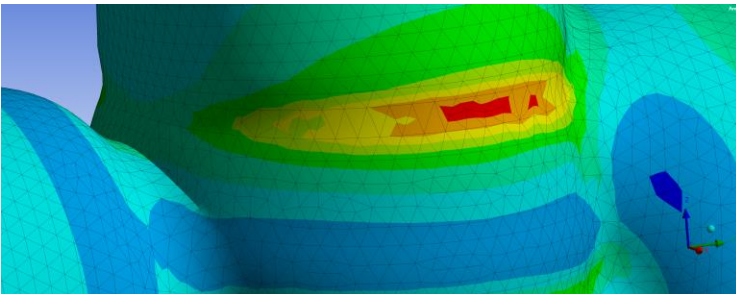
- **Evaluate All Results**

- Are the contour bands smooth in the critical regions of minimum safety factor (display results with element outlines turned on)?
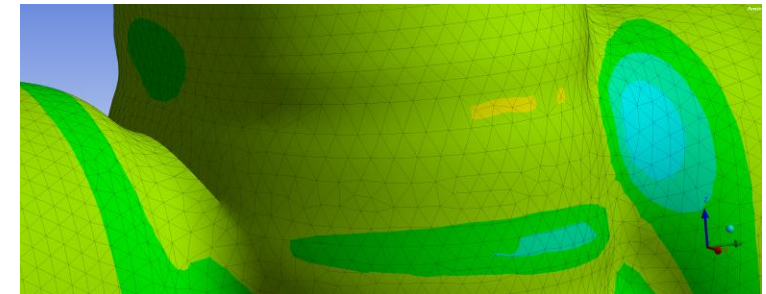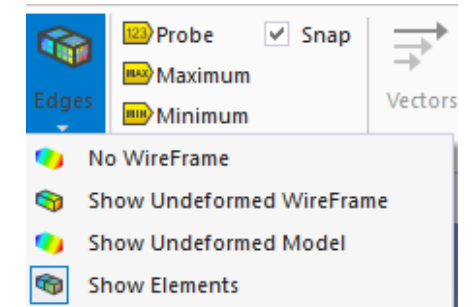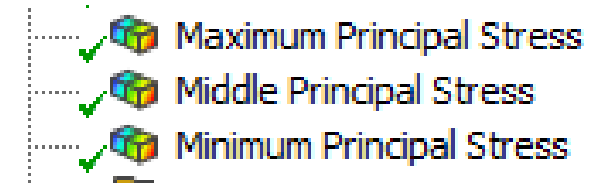
Step-by-Step Guide 08: Results and Validation

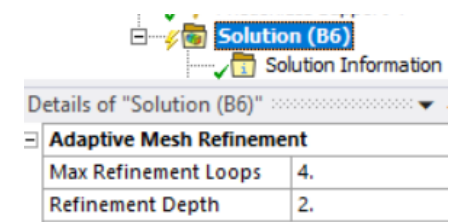Use Stress Convergence Tool on Equivalent Stress result scoped to Valve Body outer surfaces:

- **Insert Equivalent Stress** scoped to **Valve Body** outer surfaces (use **Extend to Limits** after selecting single surface)

- **Evaluate All Results**

- **RMB → Insert → Convergence** on the newly created **Equivalent Stress** result

- Set **Allowable Change** to **5%**

- On **Solution**, Set **Max Refinement Loops** to **4** in **Details**
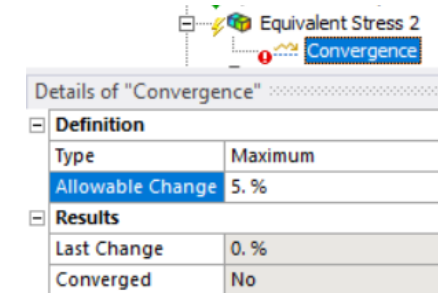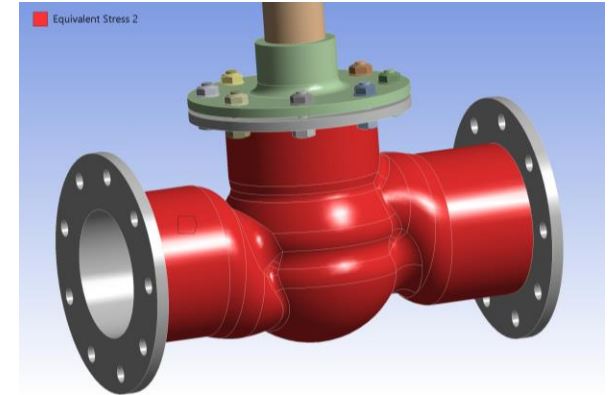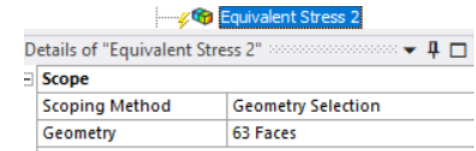
Step-by-Step Guide 08: Results and Validation

- Before solving, switch to a more efficient solver for this linear problem

- **Analysis Settings → Solver Type → Iterative**

- **Solve**
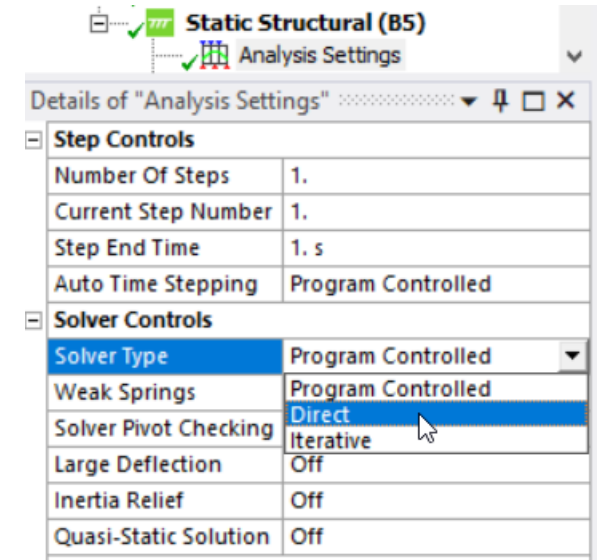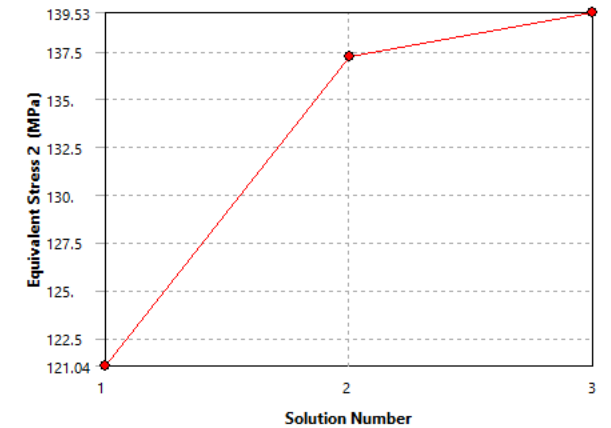
- Use Stress Convergence Tool on Equivalent Stress result scoped to Valve Body outer surfaces:

Evaluate Stress Convergence and revisit the Safety Factor for the Valve Body:

- Click on **Convergence** and review **Convergence History**

- View **Valve Body** equivalent stress with element outlines turned on

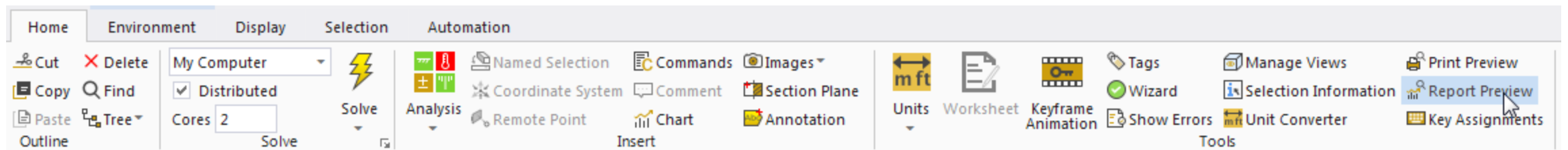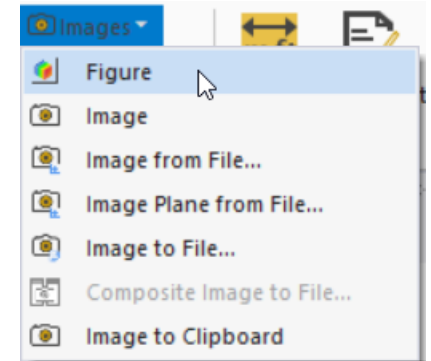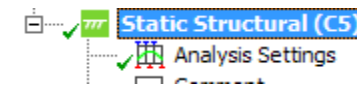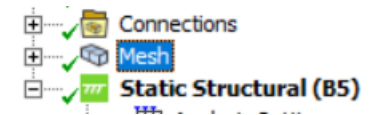- View **Safety Factor** result....has the design criteria been met?

	Equivalent Stress 2 (MPa)	Change (%)	Nodes	Elements
1	121.04		218939	129995
2	137.24	12.545	346580	217502
3	139.53	1.6566	929042	628841

Equivalent Stress 2
Convergence

Details of "Convergence"

Definition	
Type	Maximum
Allowable Change	5. %
Results	
Last Change	1.6566 %
Converged	Yes

B: Static Structural
Safety Factor
Type: Safety Factor
Time: 1

15 Max
10
5
0.91968 Min
0
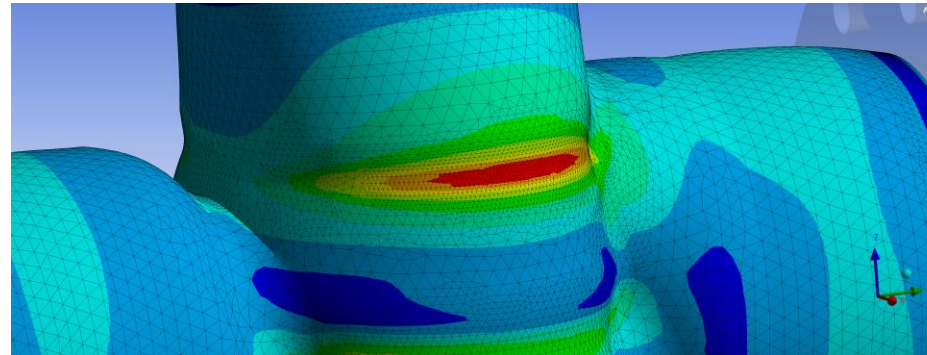
Step-by-Step Guide 08: Results and Validation

- Generate and Review a Report:

- Insert **Figures** on the **Geometry, Mesh, Static Structural Branches**

- Similarly, insert **Figures** on **Total Deformation, Converged Valve Body stress,** and **Safety Factor** results

- Click **Report Preview** on the Home tab

End of presentation