Division of Strength of Materials and Structures
Faculty of Power and Aeronautical Engineering

Finite element method (FEM1)

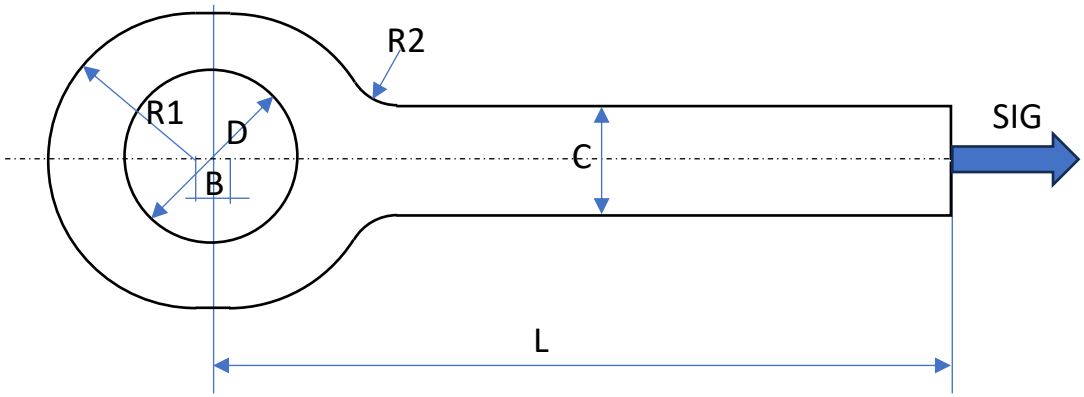
Lecture 2B. Example of a structural problem – pin connection

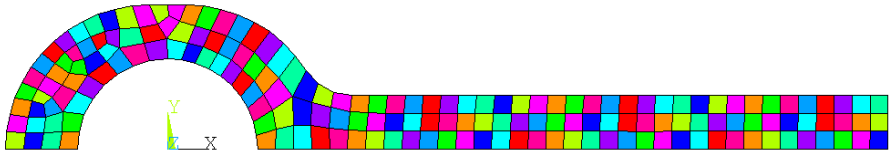
03.2025

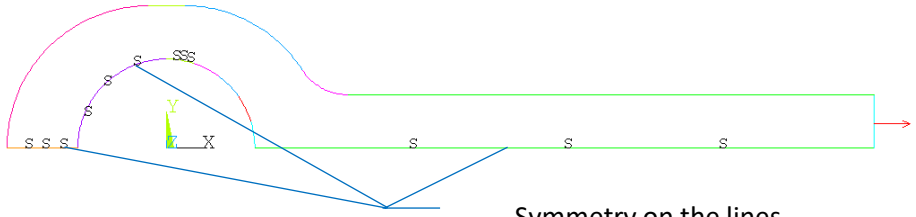
Structural problem - modeling of the pin connection

Let us assume an infinitely stiff pin.

Data: D=10mm, R1=8mm, R2=3mm, B=2mm, C=6mm, L=40mm, H=6mm, SIG=100MPa, E=2e5MPa, ν=0.3







Symmetry on the lines
(no displacements normal to the line)

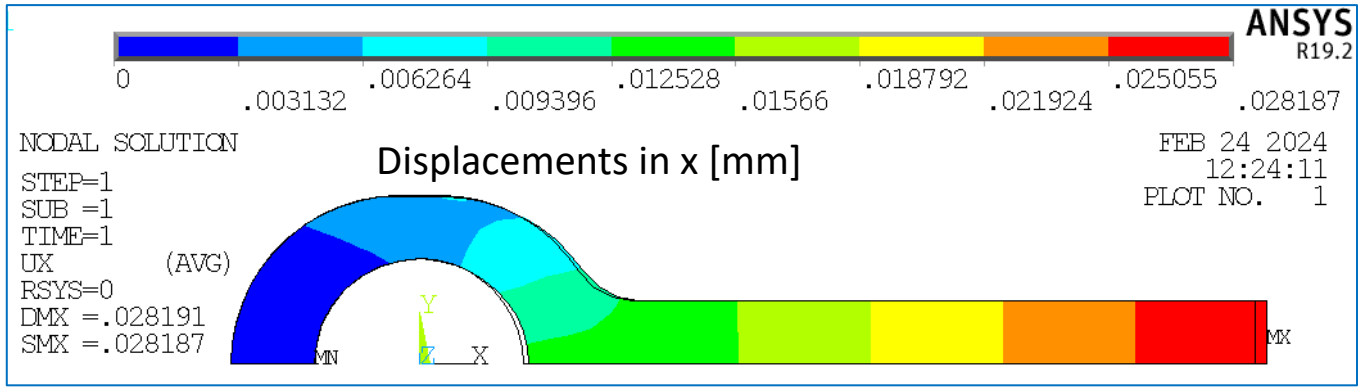
UCHO_2D.TXT

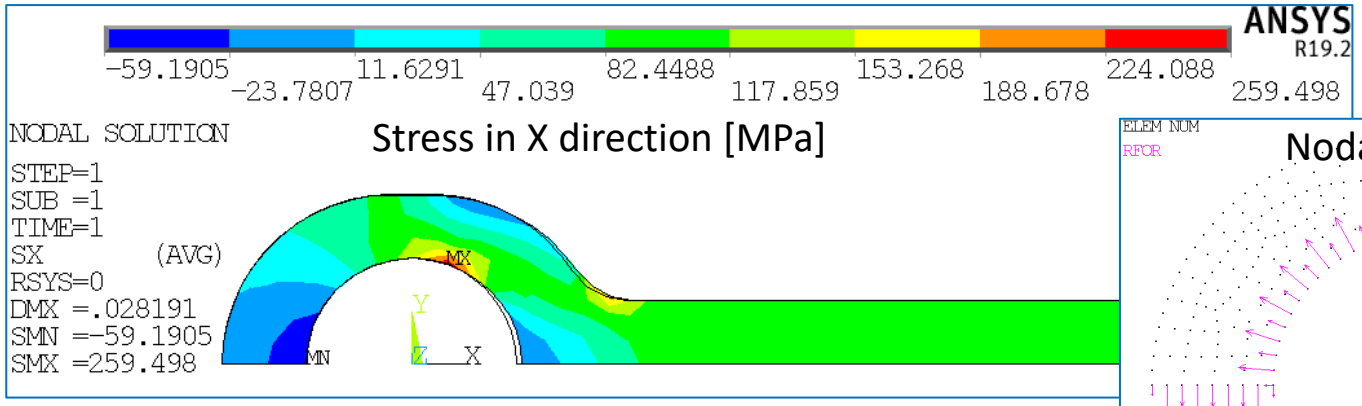
!Parameters:

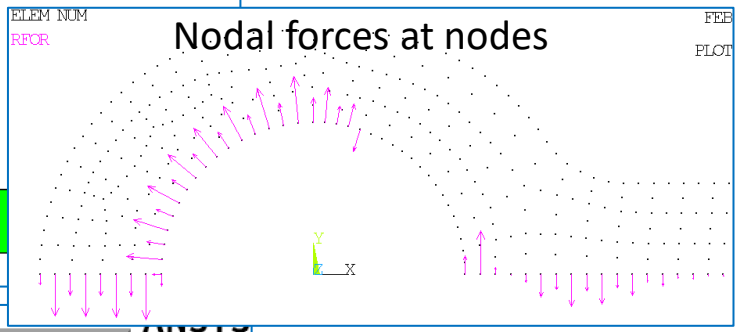
D=10 ! mm - pin diameter
R1=8 !mm- radius
R2=3 !mm- radius
B=2 !mm- lug elongation parameter
C=6 !mm- width of the rod
H=6 !mm- thickness of the rod
L=40 !mm- rod length from the center of the pin
SIG=100 !MPa- average stresses
E=2e5 !MPa- Young modulus
NI=0.3 ! Poisson ratio

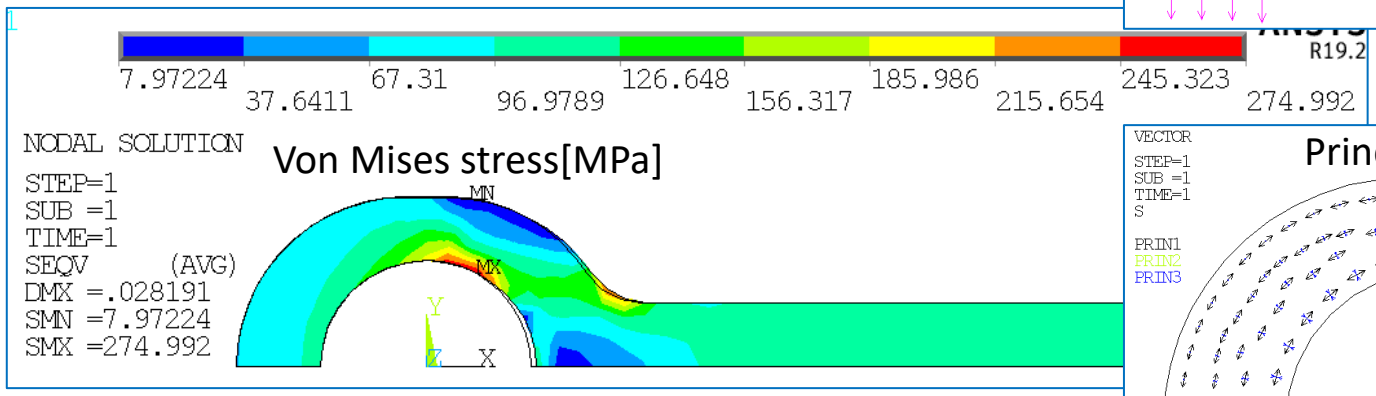
ELDLUG=1 !mm- size of the element edge

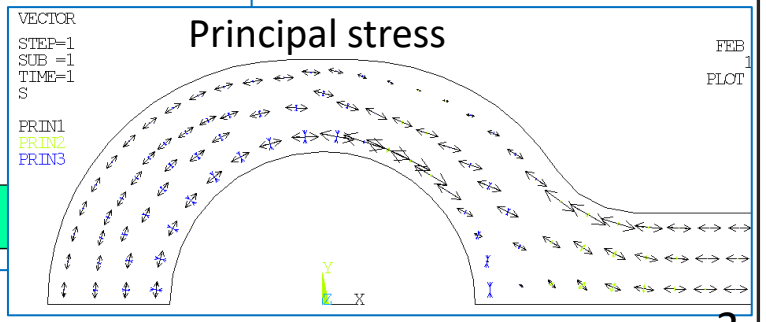
Shaping the lug of a bolt connection: simplified model ***UCHO_2D***







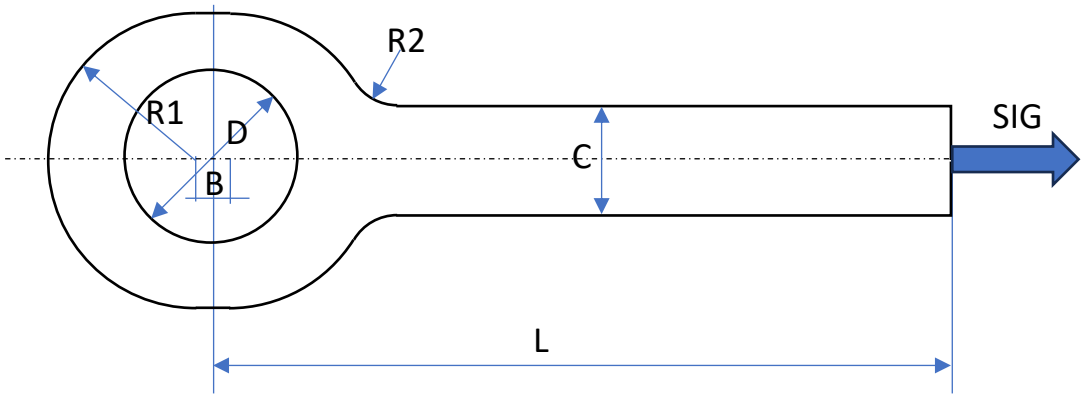


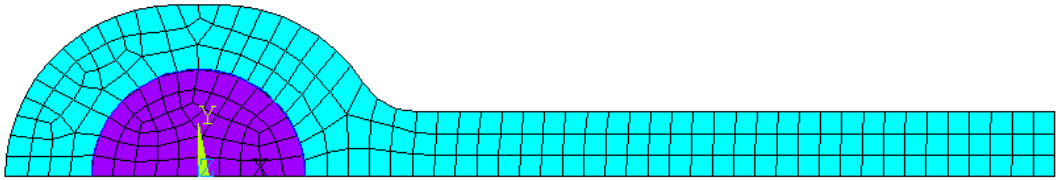


Shaping the lug of a bolt connection: More accurate model ***UCHO_2D_contact NL***

Steel Pin + Contact Elements.

Data: D=10mm, R1=8mm, R2=3mm, B=2mm, C=6mm, L=40mm, H=6mm, SIG=100MPa, E=2e5MPa, ν=0.3



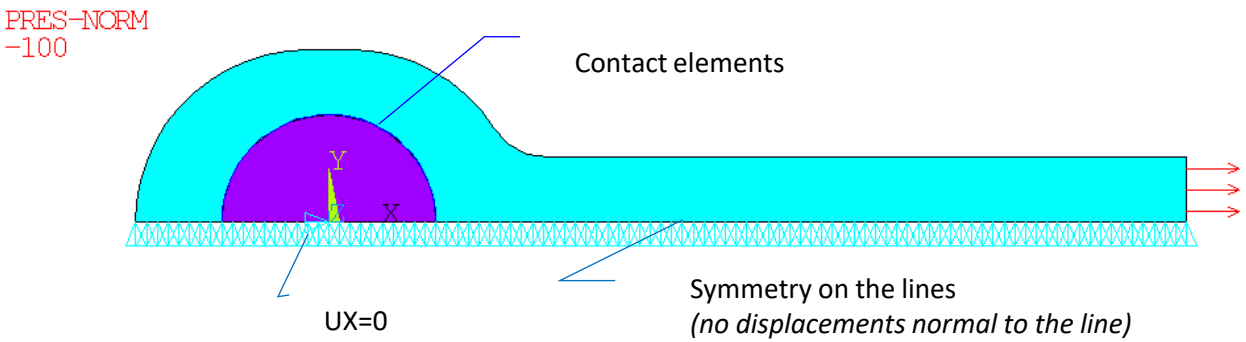


UCHO_2D_contact_NL.TXT

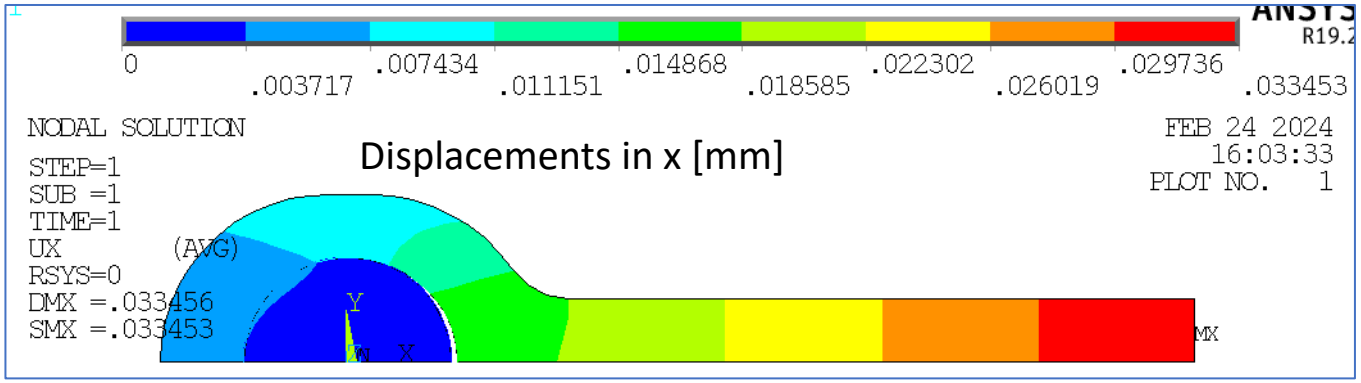
!Parameters:

D=10 ! mm - pin diameter
R1=8 !mm- radius
R2=3 !mm- radius
B=2 !mm- lug elongation parameter
C=6 !mm- width of the rod
H=6 !mm- thickness of the rod
L=40 !mm- rod length from the center of the pin
SIG=100 !MPa- average stresses
E=2e5 !MPa- Young modulus
NI=0.3 ! Poisson ratio

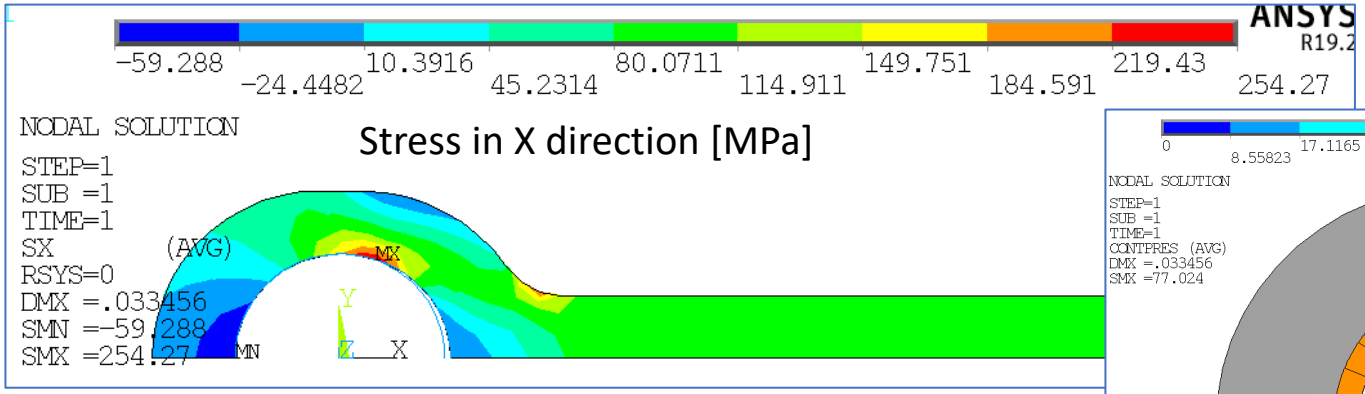
ELDLUG=1 !mm- size of the element edge



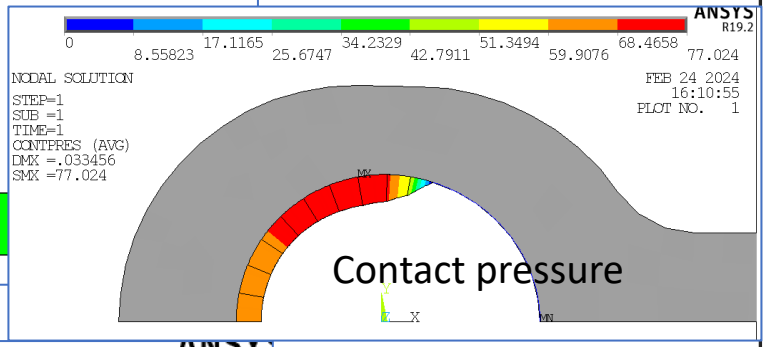
Shaping the lug of a bolt connection: More accurate model ***UCHO_2D_contact NL***



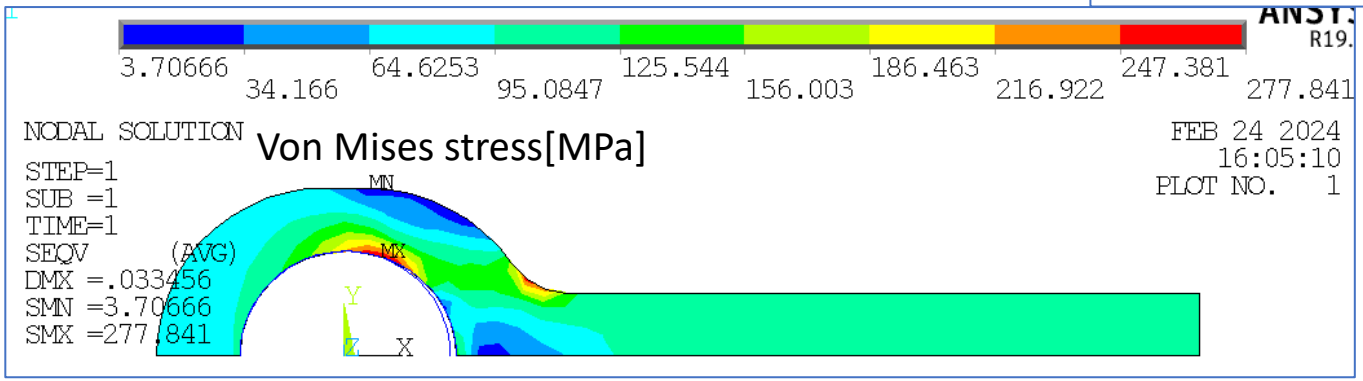
Displacements in x [mm]



Stress in X direction [MPa]



Contact pressure

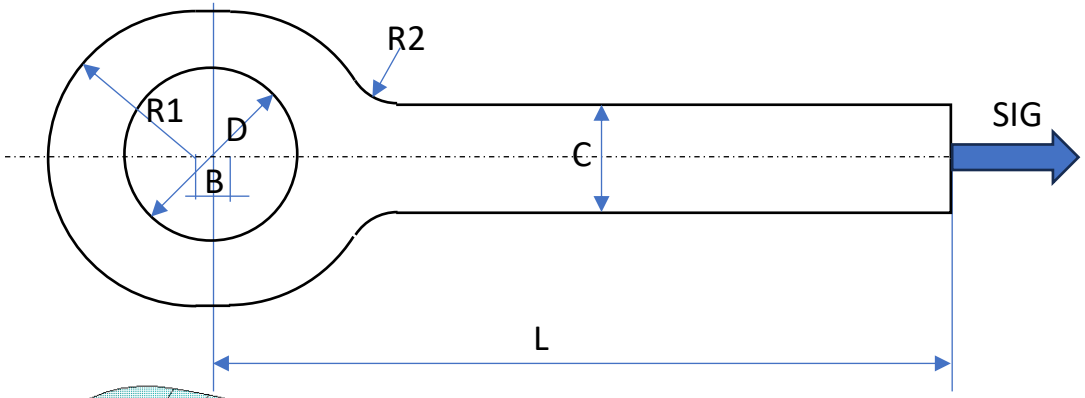


Von Mises stress[MPa]

Shaping the lug of a bolt connection : simplified model ***UCHO_3D***

Let us assume an infinitely stiff pin.

Dane: D=10mm, R1=8mm, R2=3mm, B=2mm, C=6mm, L=40mm, H=6mm, SIG=100MPa, E=2e5MPa, ν=0.3



UCHO_3D.TXT

!Parameters:

D=10 ! mm - pin diameter
R1=8 !mm- radius
R2=3 !mm- radius
B=2 !mm- lug elongation parameter
C=6 !mm- width of the rod
H=6 !mm- thickness of the rod
L=40 !mm- rod length from the center of the pin
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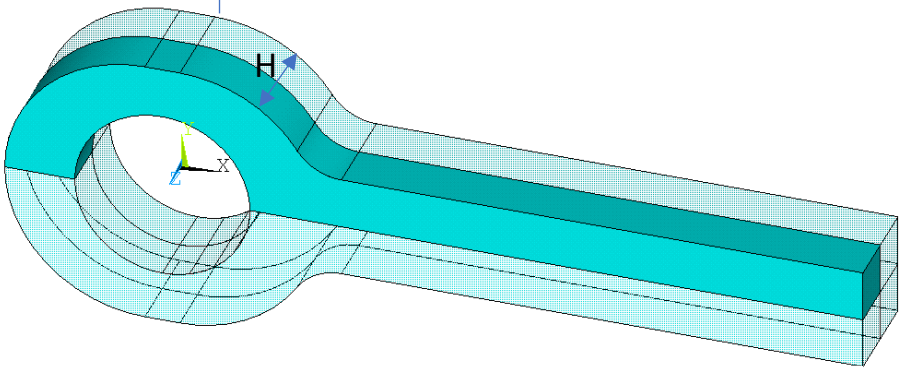
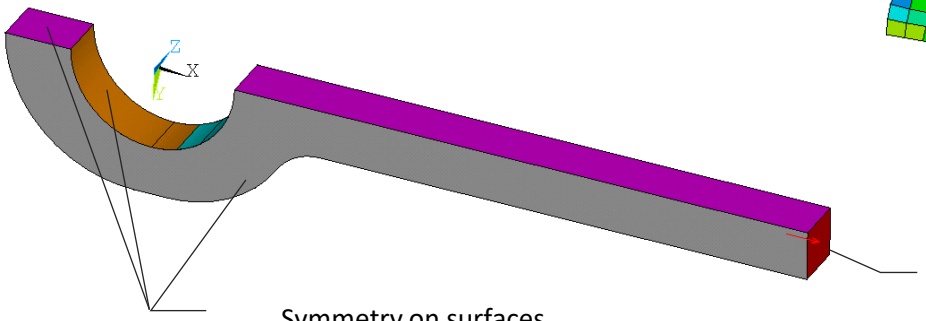
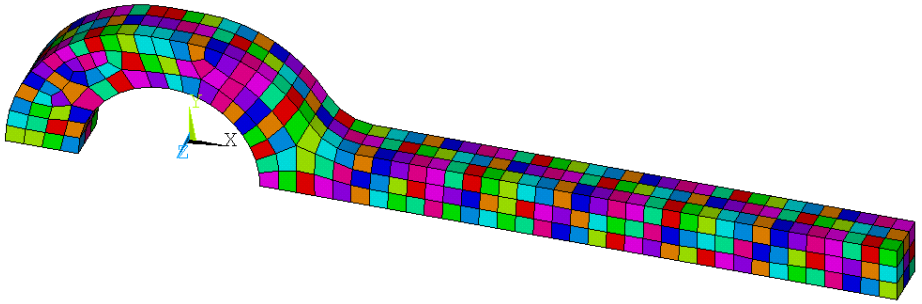


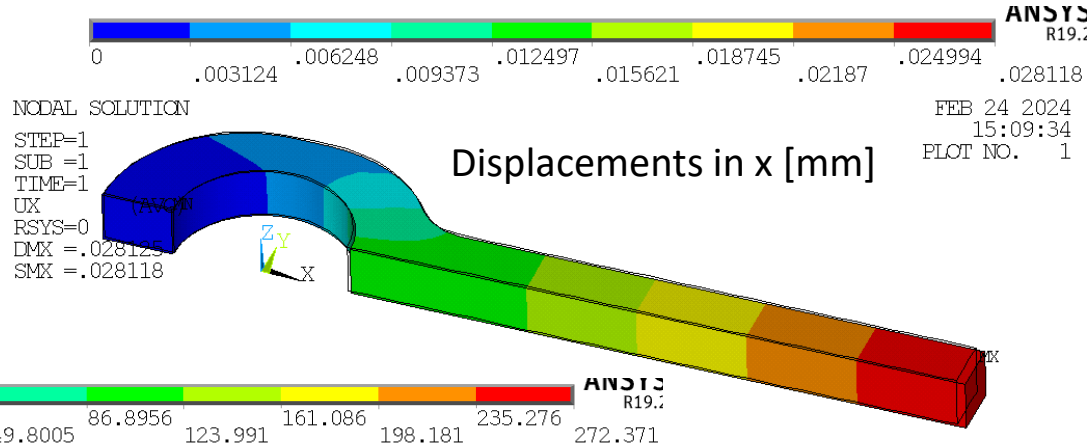


Symmetry on surfaces
(no displacements normal to the surface)

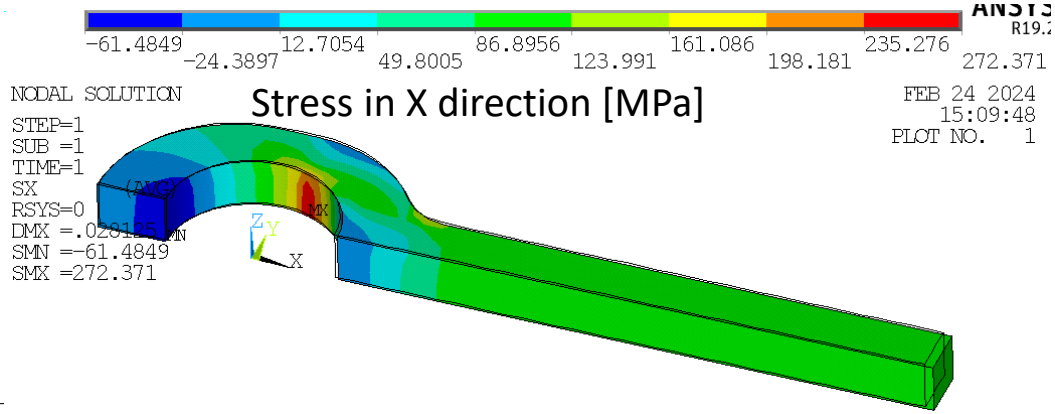


Negative pressure on the surface

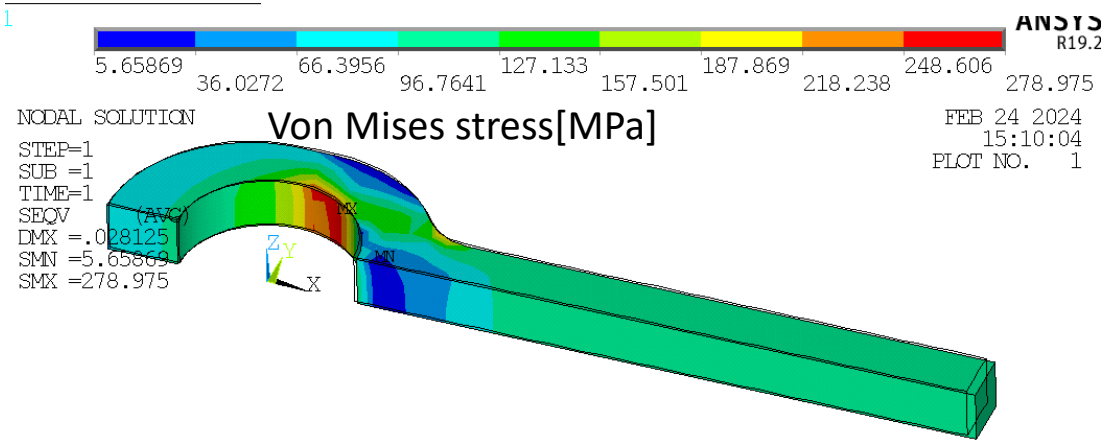
Shaping the lug of a bolt connection : simplified model ***UCHO_3D***



Displacements in x [mm]



Stress in X direction [MPa]



Von Mises stress[MPa]

Principal stress