

Latest & future developments
for Durability analysis and for
analysis of structures made of
Composites

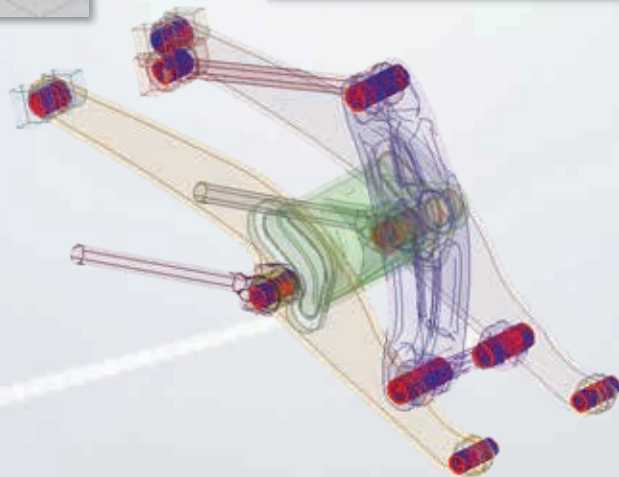
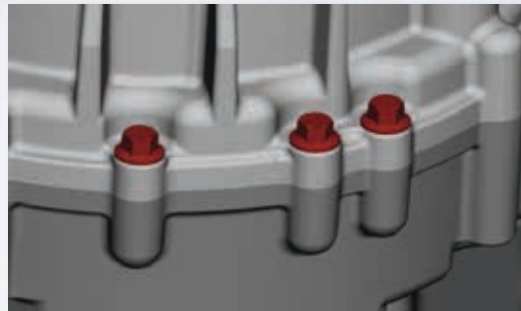
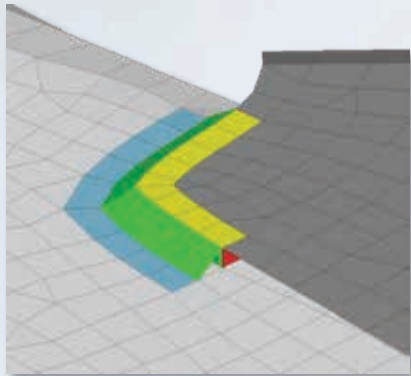


BETA
SIMULATION SOLUTIONS



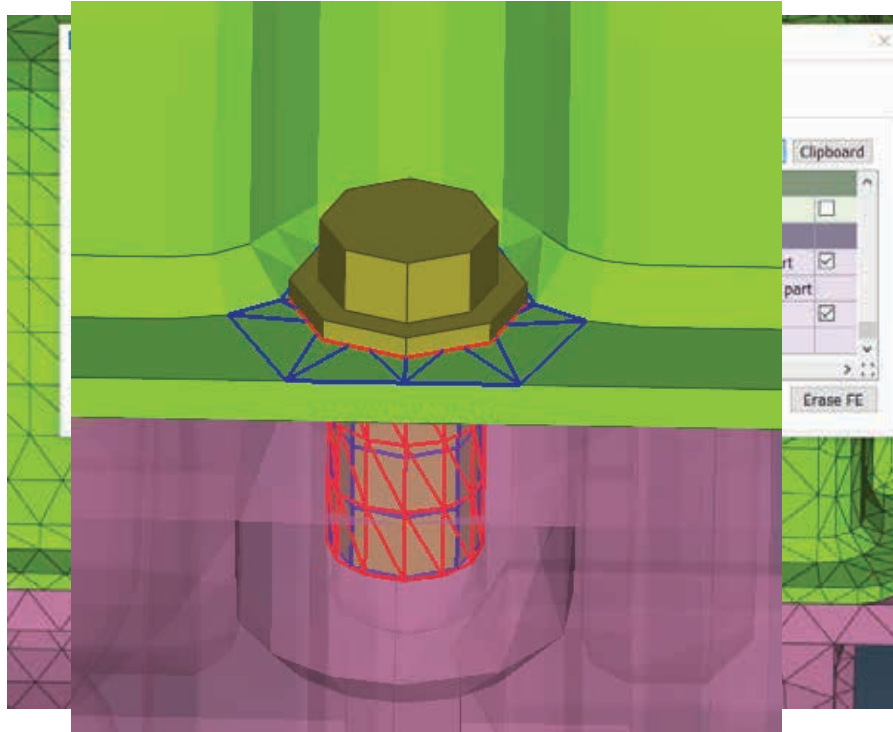
Durability

ANSA
PRE PROCESSOR



Assembly

Bolt Connections



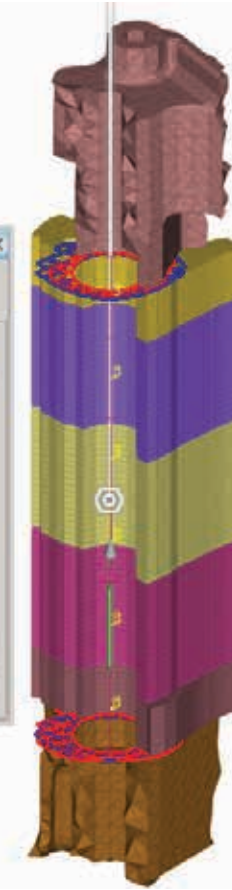
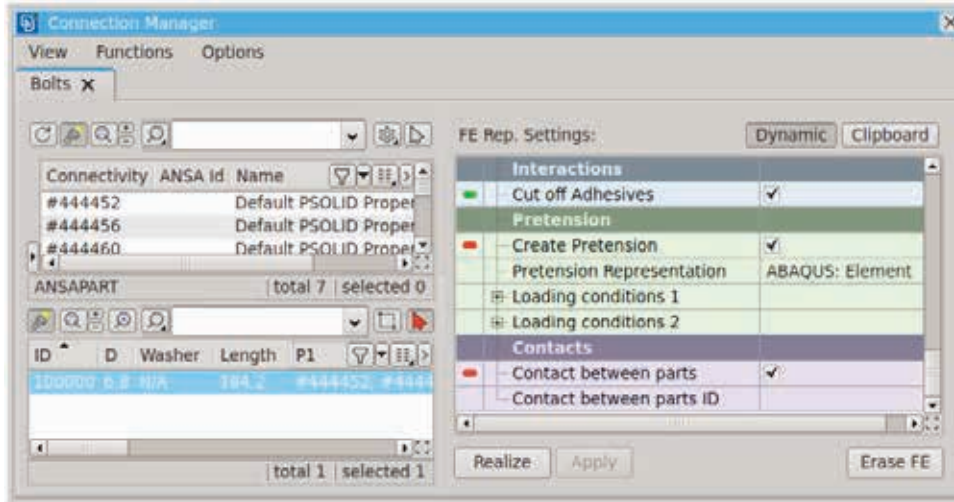
Contacts through SOLID BOLT FE Representation

- Contact between head and top part
- Contact between head and thread
- Tied contact between thread and last part
- Available for Abaqus, Ansys, Nastran

v22.1.x

Bolt Connections

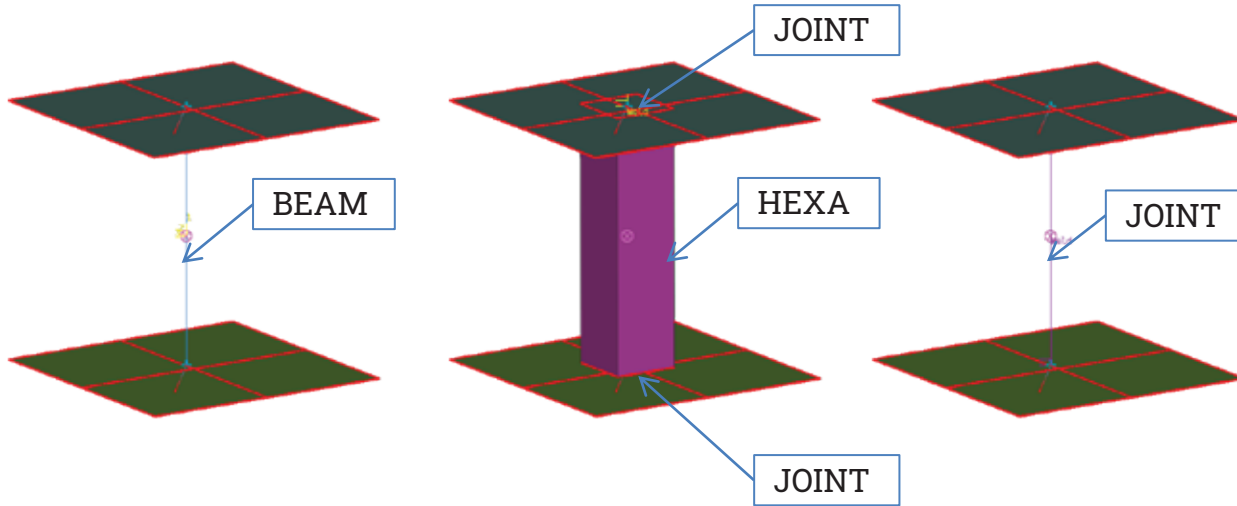
v23.0.0



Pretension and Contacts for BOLT ON SOLID – FE Representation

- Pretension on beams
- Appropriate Steps and loading conditions
- Contacts between connectivity parts
- Supported for Abaqus, Ansys, Nastran NX and Pam-Crash

Spotweld Connections



ANSYS new FE representations

v23.1.0

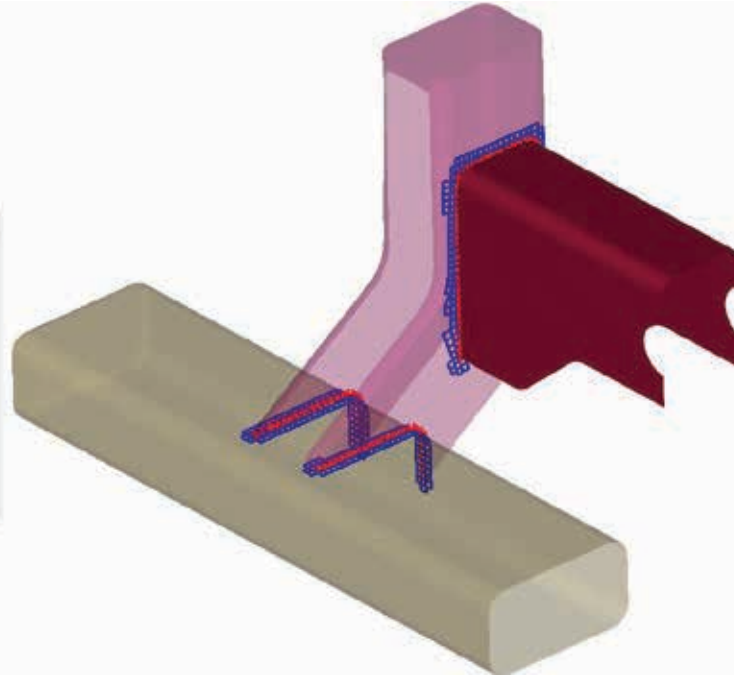
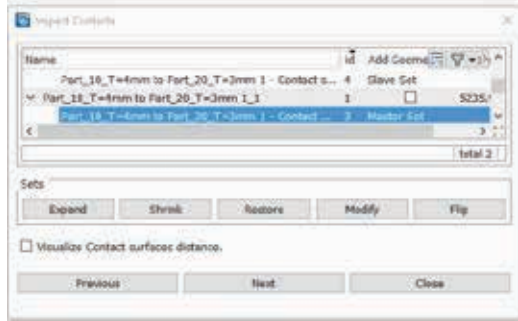
- ANSYS BEAM contact
- ANSYS HEXA contact
- ANSYS JOINT contact

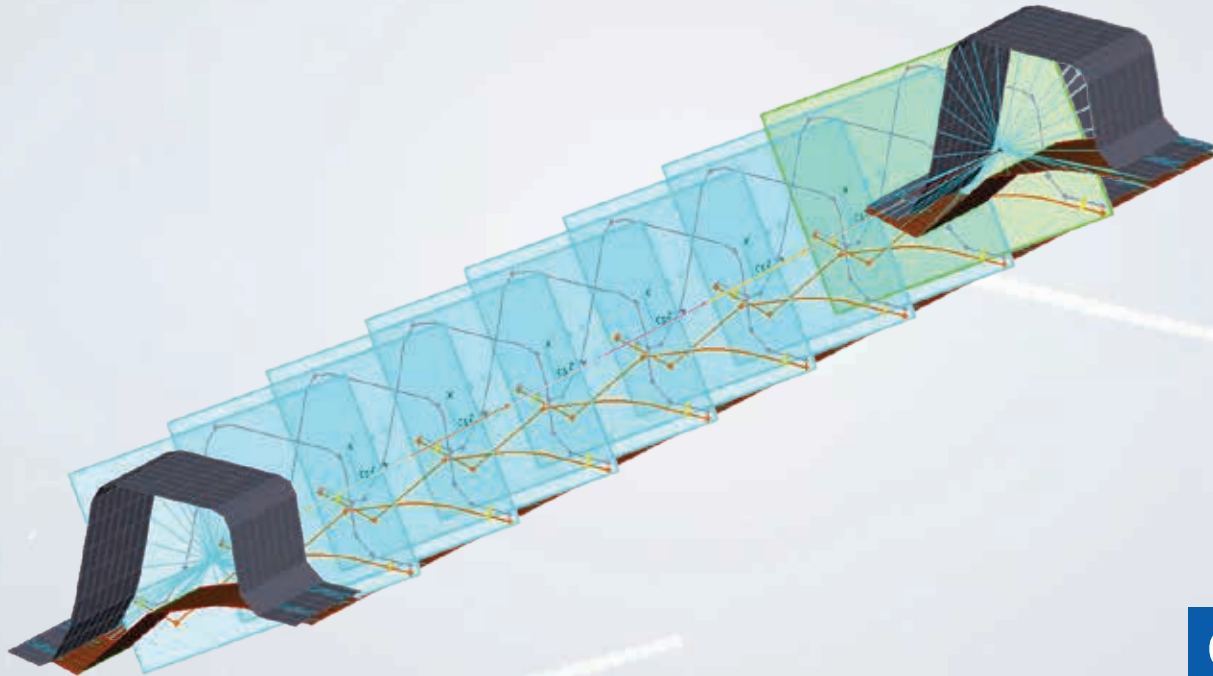
Contact Interfaces

v22.0.0

Node to Surface contacts through Contact Assistant

- Automatic detection based on proximity
- Flipping Surfaces
- Inspection of surfaces contents





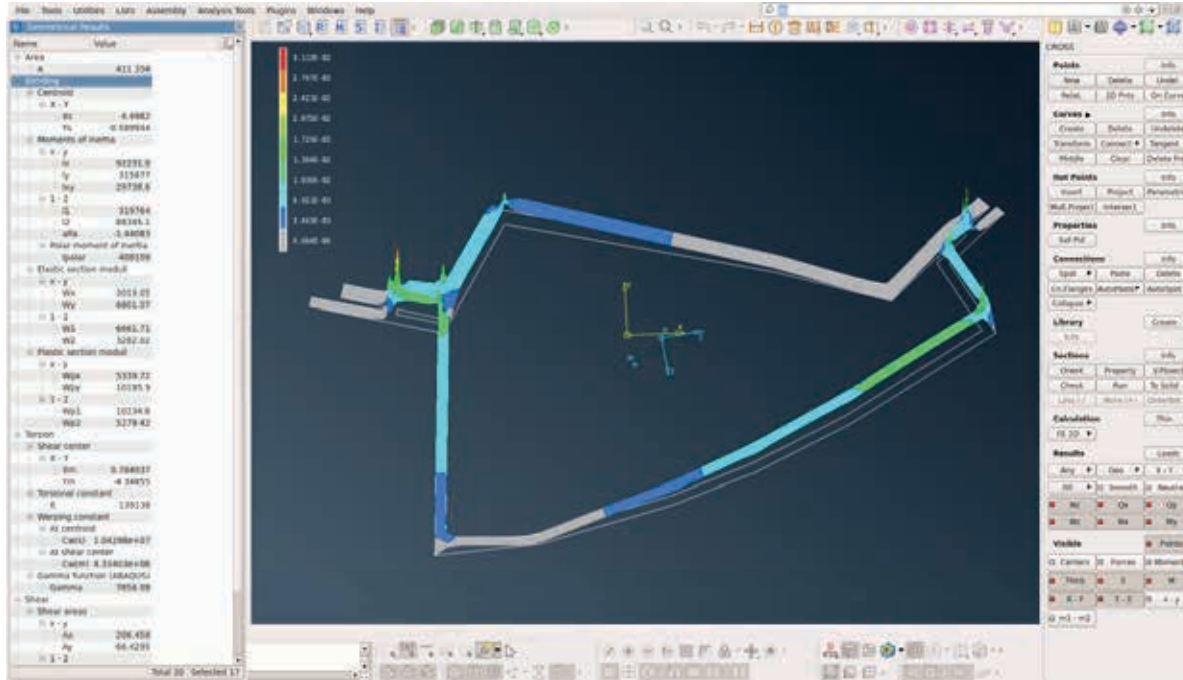
Cross sections

Cross Section Tool

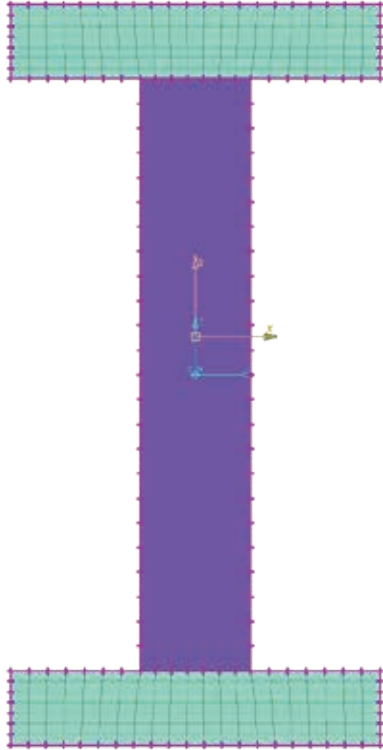
v22.0.0

New Cross Sections Solver – FE 2D

- Cross sectional properties of thin and solid sections calculated with FE 2D analysis



Cross Section Tool

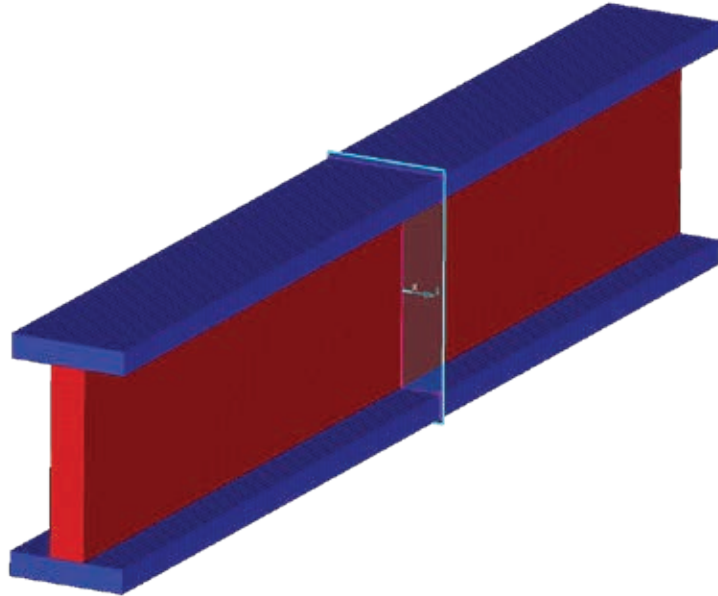


Name	Value
Reference Material	
Eref	70000
νref	0.33
Area	
A	168
Tension	
Axial stiffness	
EA	1.170e+07
Capacities	
First yield	
N_fyc	11850
Fully plastic	
N_fpc	26480
Bending	
Centroid	
Moments of inertia	
Elastic section moduli	
Plastic section moduli	
Bending stiffness	
X - Y	
EIx	7.54886e+08
EIy	7.25201e+07
Eixy	0.0122156
I - 2	
EI1	7.54886e+08
EI2	7.25201e+07
m1 - m2	
EIm1	
EIm2	
EIm12	
Polar stiffness	
EIpolar	8.27406e+08
Capacities	
First yield in X - Y direction	
Mx_fyc	181960
My_fyc	37986.7
Fully plastic in X - Y direction	
Mx_fpc	223920
My_fpc	59789.3
Torsion	
Shear center	
Torsional constant	
Warping constant	
Gamma function (ABAQUS)	
Torsional stiffness	
GI _t	8.64085e+06
Shear	

Cross Section Results

- First Yield capacities
 N_{fyc} , Mx_{fyc} , My_{fyc}
- Fully Plastic capacities
 N_{fpc} , Mx_{fpc} , My_{fpc}

Cross Section Tool

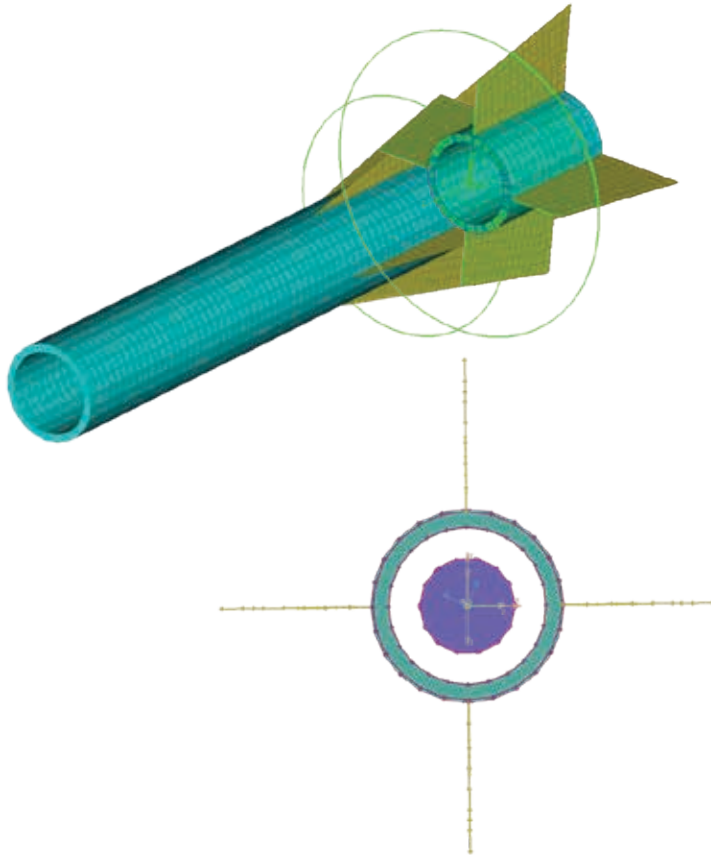


Name	Value
Geometrical Results	
Reference Material	
Eref	70000
νref	0.33
Area	
A	168
Bending	
Centroid	
X - Y	
Xs	3.56373e-15
Ys	1.00577e-14
Moments of inertia	
x - y	
Ix	11106.4
Iy	1504.91
Ixy	5.73119
I - 2	
I1	11106.4
I2	1504.91
α1α2	0.000596907
Polar moment of inertia	
Ipolar	12611.3
Elastic section moduli	
x - y	
Wx	1110.64
Wy	300.982
I - 2	
W1	1110.64
W2	300.981
Plastic section moduli	
x - y	
Wpx	1208
Wpy	318
I - 2	
Wp1	1208
Wp2	318
Torsion	
Shear center	
X - Y	
Xm	5.01614e-10
Ym	9.80116e-09
Torsional constant	
It	670.716
Total 30 selected 0	

Calculation of Non Homogeneous Solid Cross Sections

- Supported in FE & FE 2D cross solvers

Cross Section Tool



Name	Value
Area	
A	3031.9
Bending	
Centroid	
X - Y	
Xs	-1.65216e-05
Ys	-0.00244482
Moments of inertia	
x - y	
Ix	7.59015e+06
Iy	7.59046e+06
Ixy	1.99524
I - J	
I1	7.59046e+06
I2	7.59015e+06
alfa	-1.56442
Polar moment of inertia	
Jpolar	1.51806e+07
Elastic section modul	
X - Y	
Wx	40604.1
Wy	40604.1
I - J	
W1	40604.6
W2	40603.2
Plastic section modul	
X - Y	
Wpx	141482
Wpy	141437
I - J	
Wp1	141315
Wp2	141271
Torsion	
Shear center	
X - Y	
Xm	-0.00406649
Ym	0.00381896
Torsional constant	
It	1.04165e+07
Warping constant	
At centroid	
Cw(s)	401662
At shear center	
Cw(m)	401398
Gamma function (ABAQUS)	
Gamma	124.706
Total 30 selected 0	
Gamma	70.5788
Total 30 selected 0	

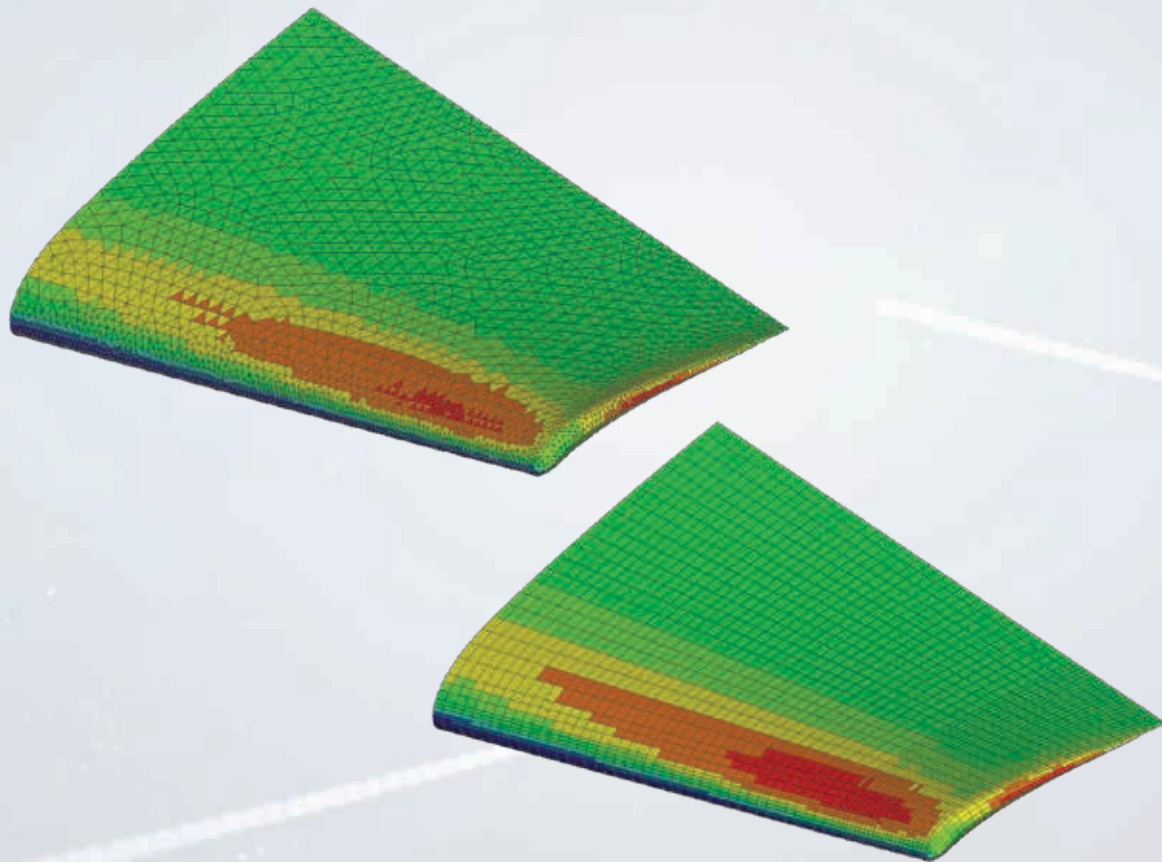
Cross Section tool

FE Solver:

- Calculation of Mixed Thin-Solid cross sections

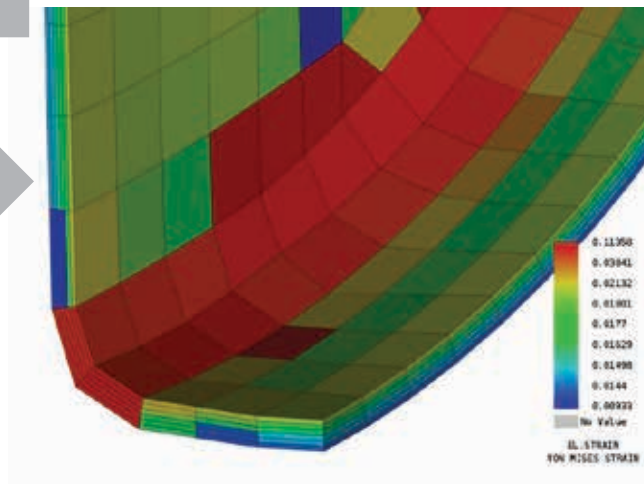
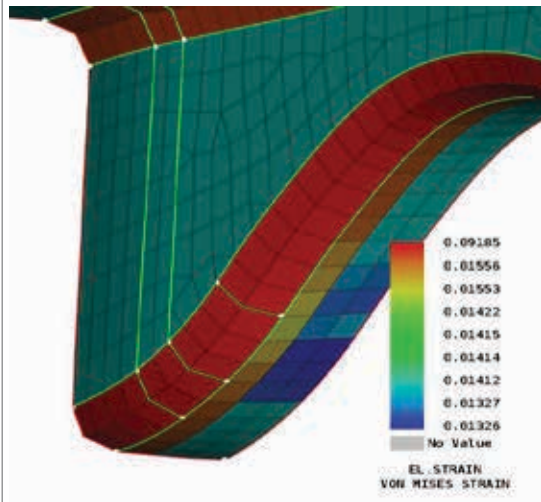
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ANSA
PRE PROCESSOR



Results Mapper

Results Mapper Tool

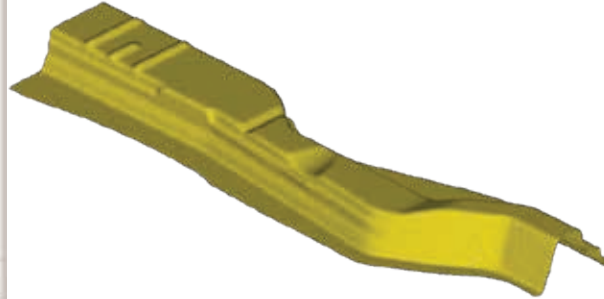
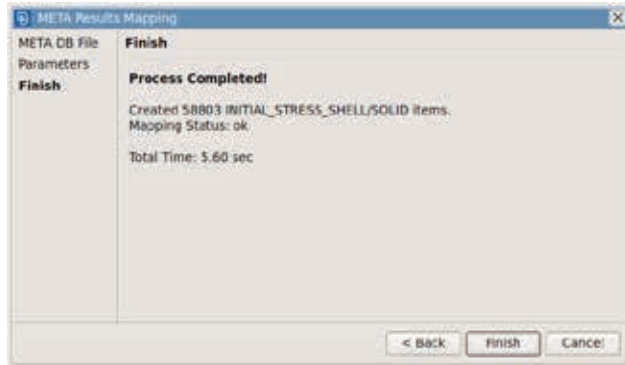


Source Locations	Integration Points
Target Locations	Auto
Use Closest	Auto
Extrapolate	Integration Points
Report	<input checked="" type="checkbox"/>

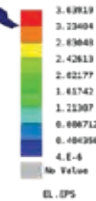
Result Mapper Tool on Integration Points

- Results on integration points over thickness of shells or solids can be used for mapping
- Available both for source and target model
- Supported with RBF method

Results Mapper Tool



Abaqus	INITIAL CONDITION=HARDENING
Nastran	IPSTRAIN
LS-DYNA	INITIAL_STRESS_SHELL INITIAL_STRESS_SOLID
Radioss	INITIAL_EPSP_SHELL INIBRI_STRS_F



META Results Mapping plugin

Mapping of Equivalent Plastic Strains

- Results of META Db:
 - EPS
 - PEEQ
 - EquivalentPlasticStrain

- Map to initial condition solver entities for Abaqus, Nastran, LS-DYNA, Radioss

ANSA

PRE PROCESSOR

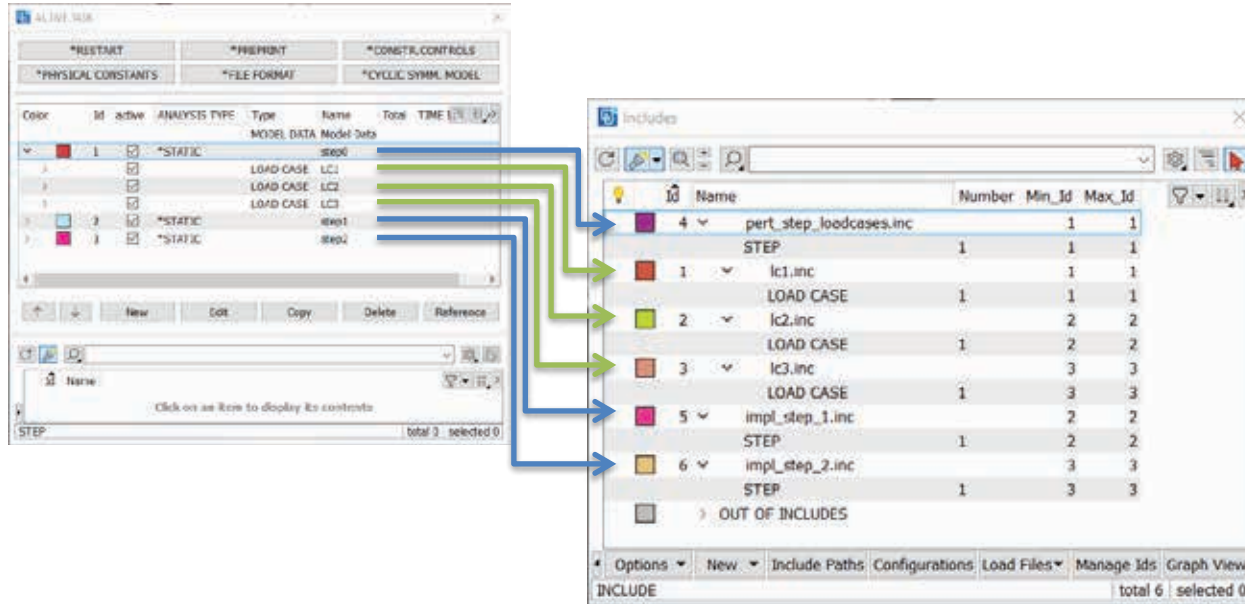


META

POST PROCESSOR

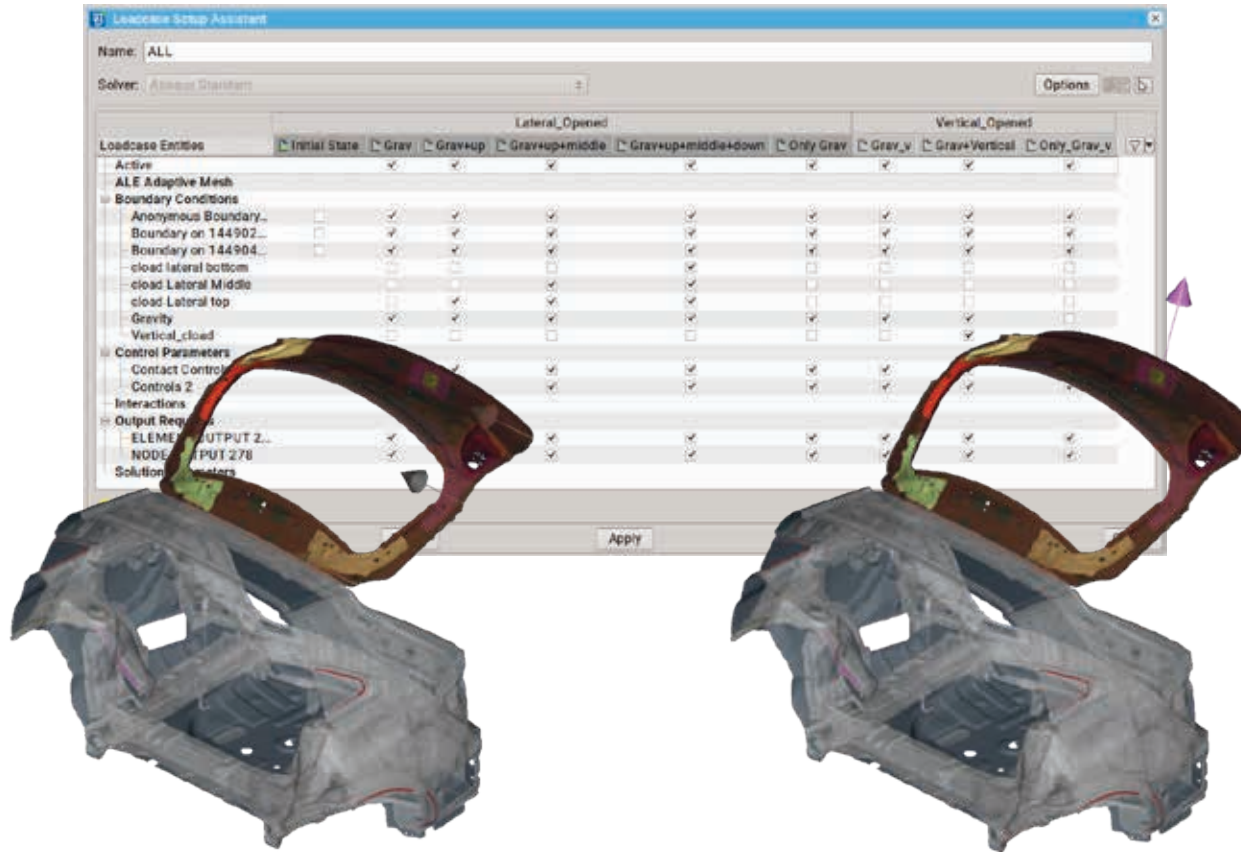


Specific Solver
Features & Techniques



ABAQUS *STEP and *LOADCASE to Includes

Step and Loadcase keywords can now be split to separate include files

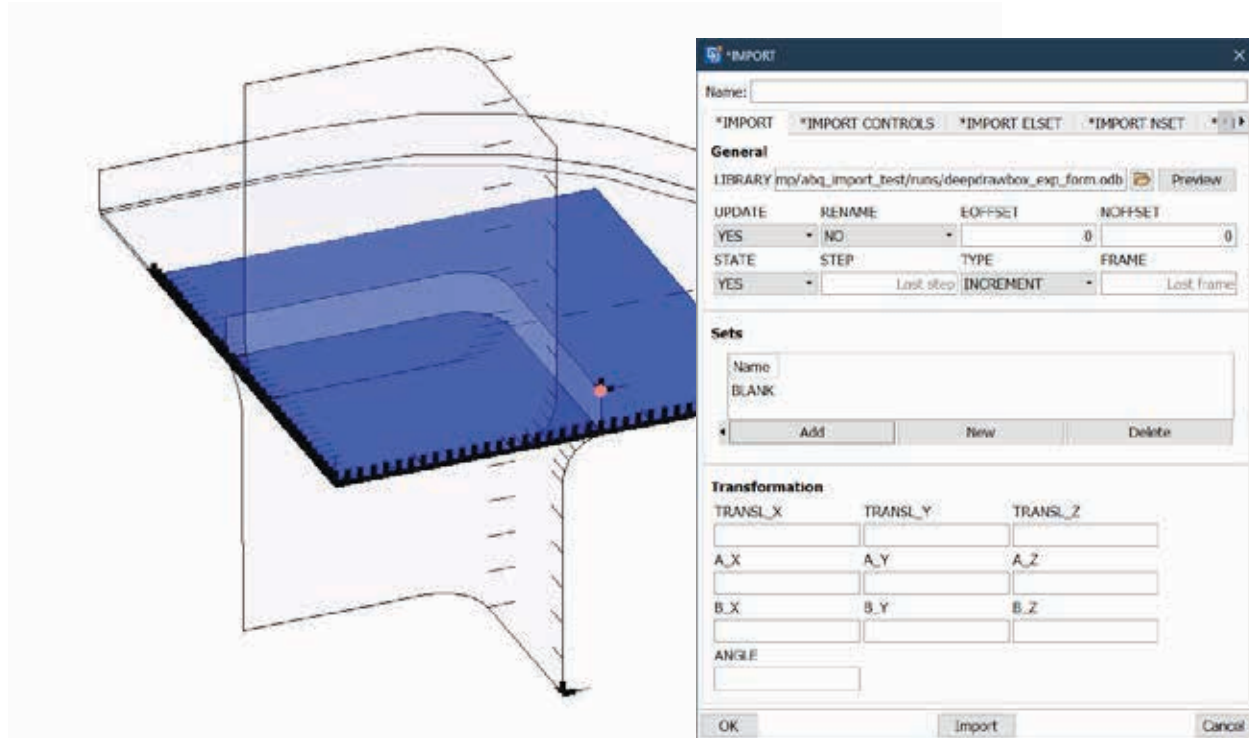


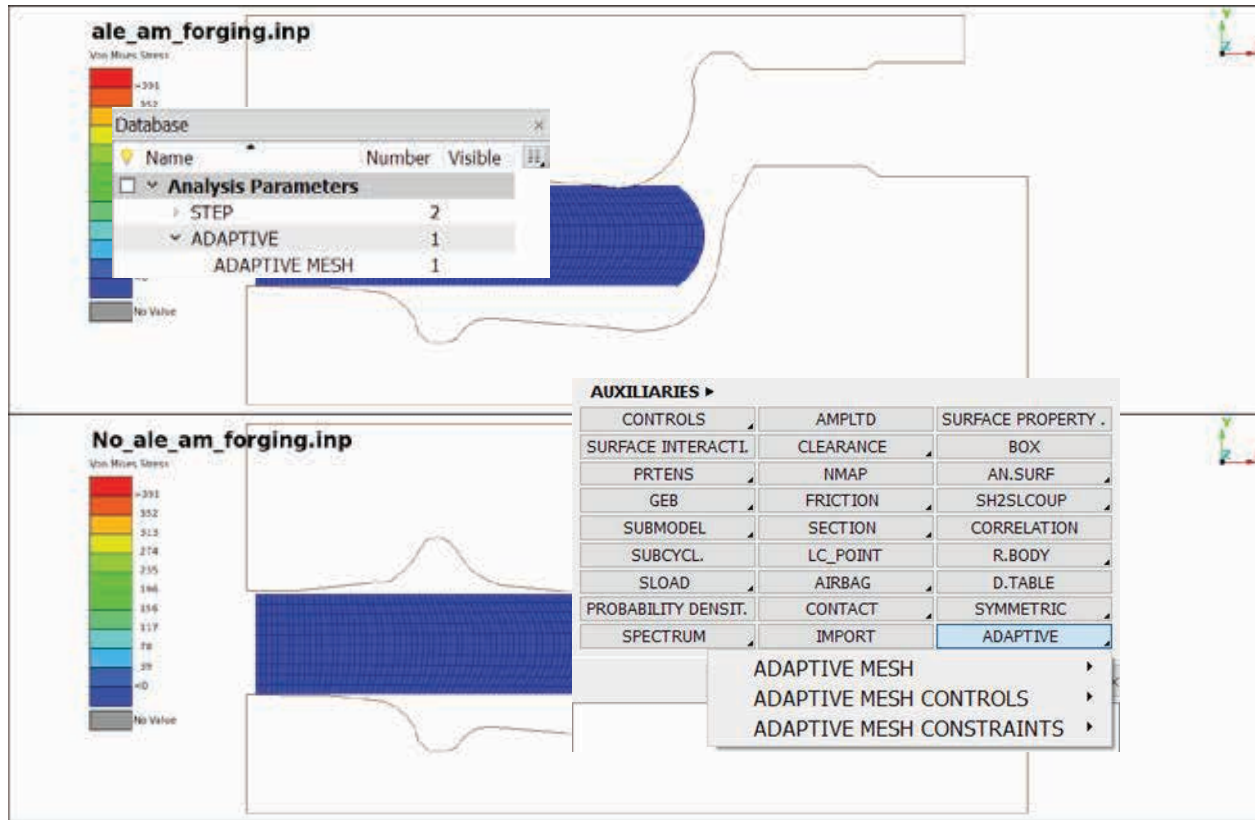
Building an evolution analysis

- Set up Multiple nonlinear load cases
- *MANIFEST available in:
 - Step Manager*
 - Loadcase Assistant*

Transferring results between analyses

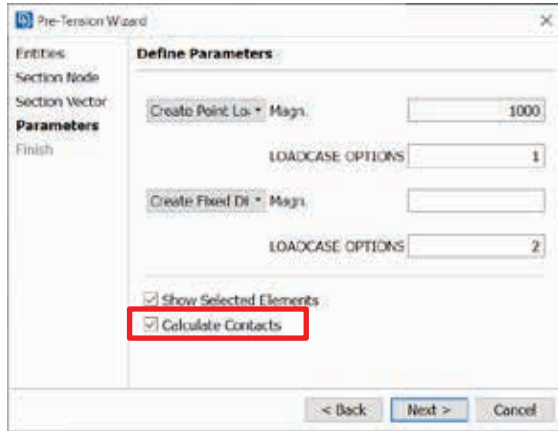
- Support of *IMPORT
- Example:
 1. Deep drawing with Abaqus/Explicit
 2. *IMPORT deformed geometry and stresses
 3. Spring back with Abaqus/Standard





Enabling the adaptive mesh technique

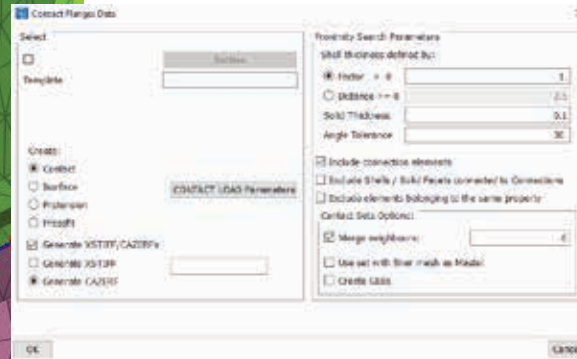
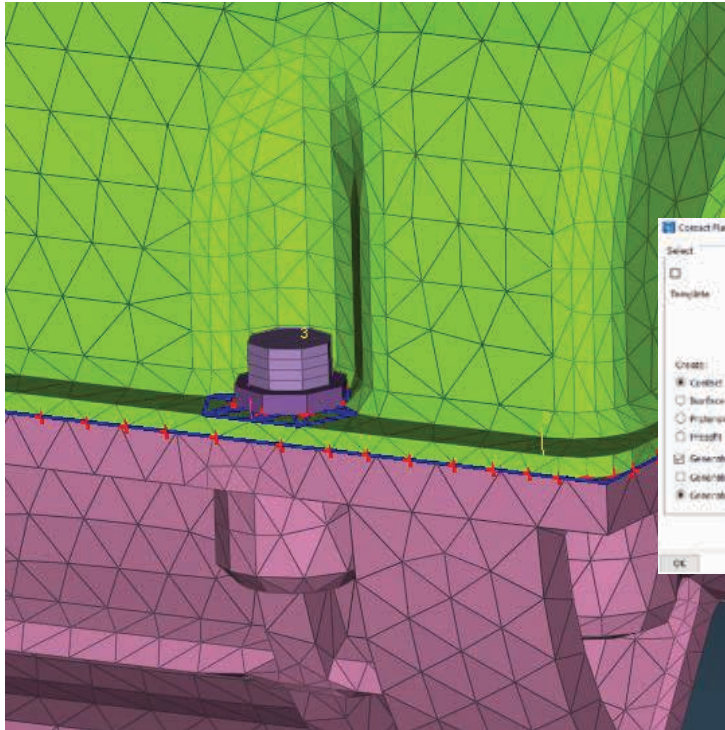
- Define an adaptive mesh domain
- Supported:
 - *ADAPTIVE MESH
 - *ADAPTIVE MESH CONSTRAINTS
 - *ADAPTIVE MESH CONTROLS



Marc Pretension Assistant

v23.0.0

- Automatic generation of pretension respective keywords
- Definitions of appropriate loadcases
- Auto-Detection of contacts around solid bolt

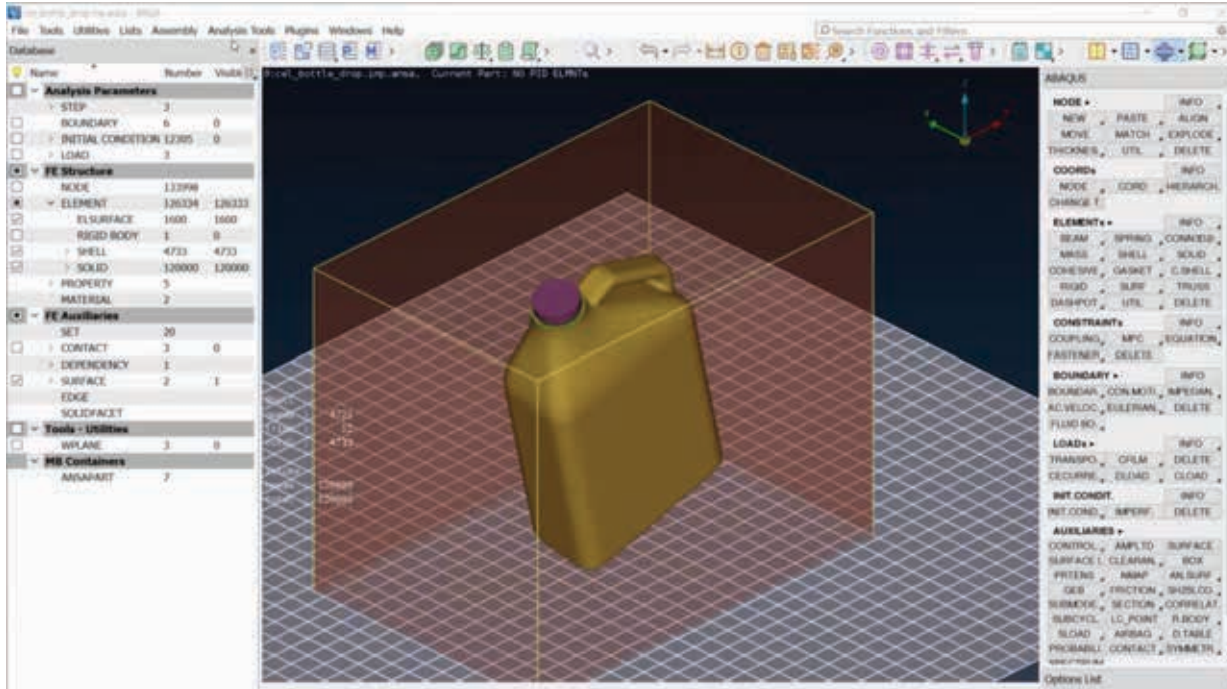


Contact Flanges improvements

- Definition of Load parameters for contacts, pretensions and Pressfit
- Springs to restrain rigid body motion

Common feature for Solver Modules

v23.0.0



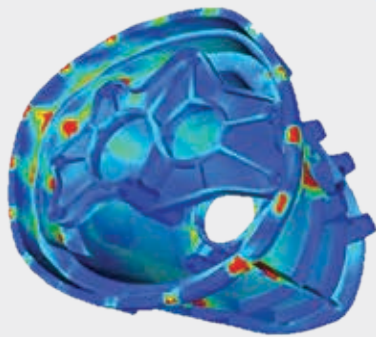
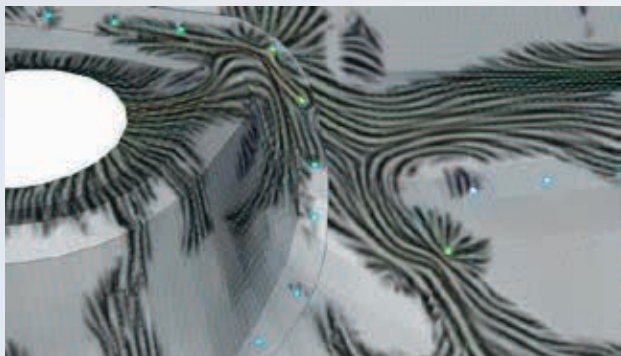
Direct job submission

- Submit
- Execute
- Monitor
- Data Check
- Available in Abaqus, Ansys, Marc, Nastran, Optistruct, Permas



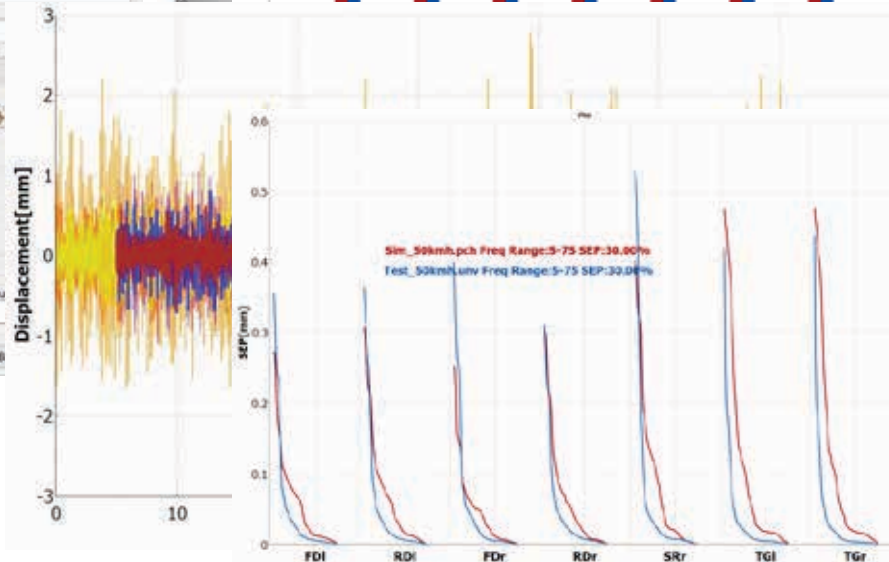
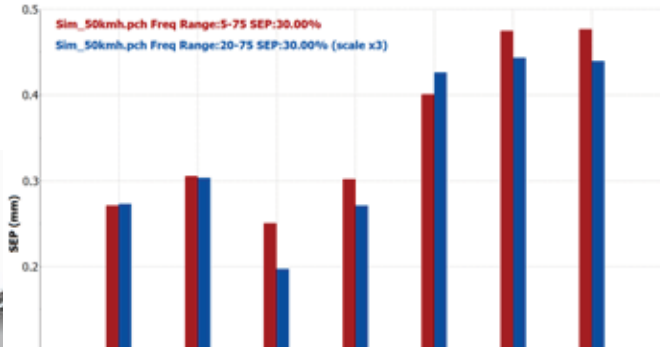
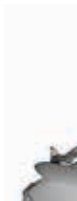
META

POST PROCESSOR



META Toolbars

User Toolbars

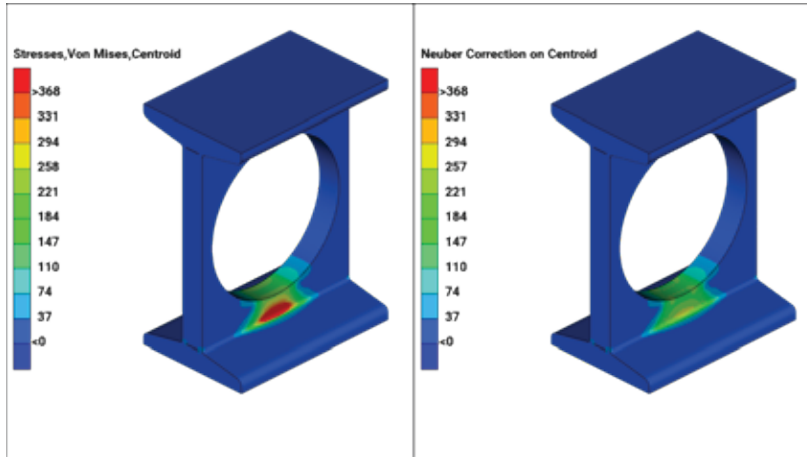
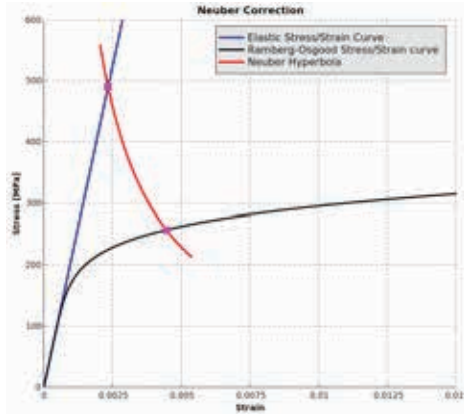


Supported results
 CAE: Nastran
 Test: *.unv
 MBS: Adams

ODF – Opening Distortion Fingerprint

- Body stiffness evaluation through the distortion of closure openings
- Based on dynamic simulations/ measurements
- Evaluation of distortion per opening :
 - Max bar chart
 - Over frequency range
- Direct comparison measurement/ computation

User Toolbars



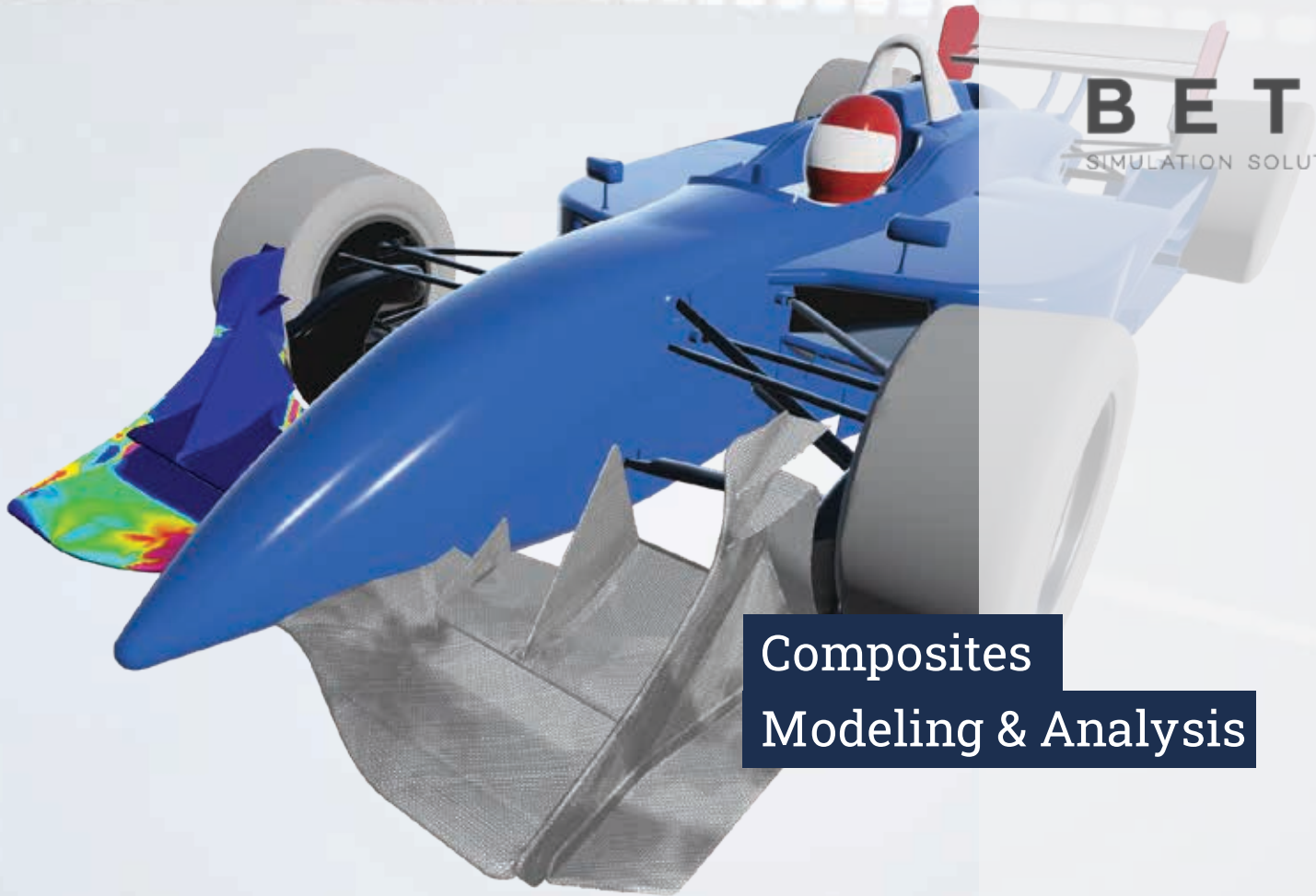
Neuber Correction

- New User Toolbar
- Calculate the equivalent plastic stress from a linear elastic analysis



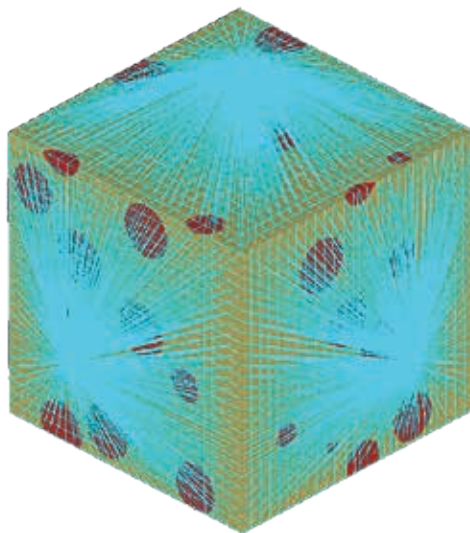
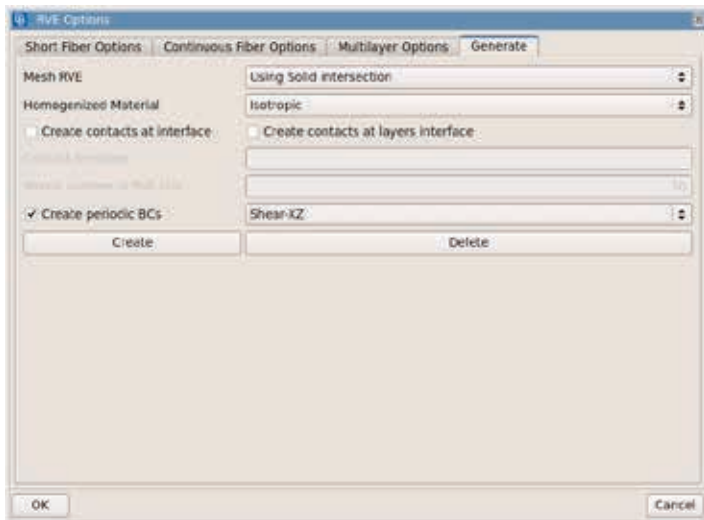
BETA

SIMULATION SOLUTIONS



Composites
Modeling & Analysis

Composites

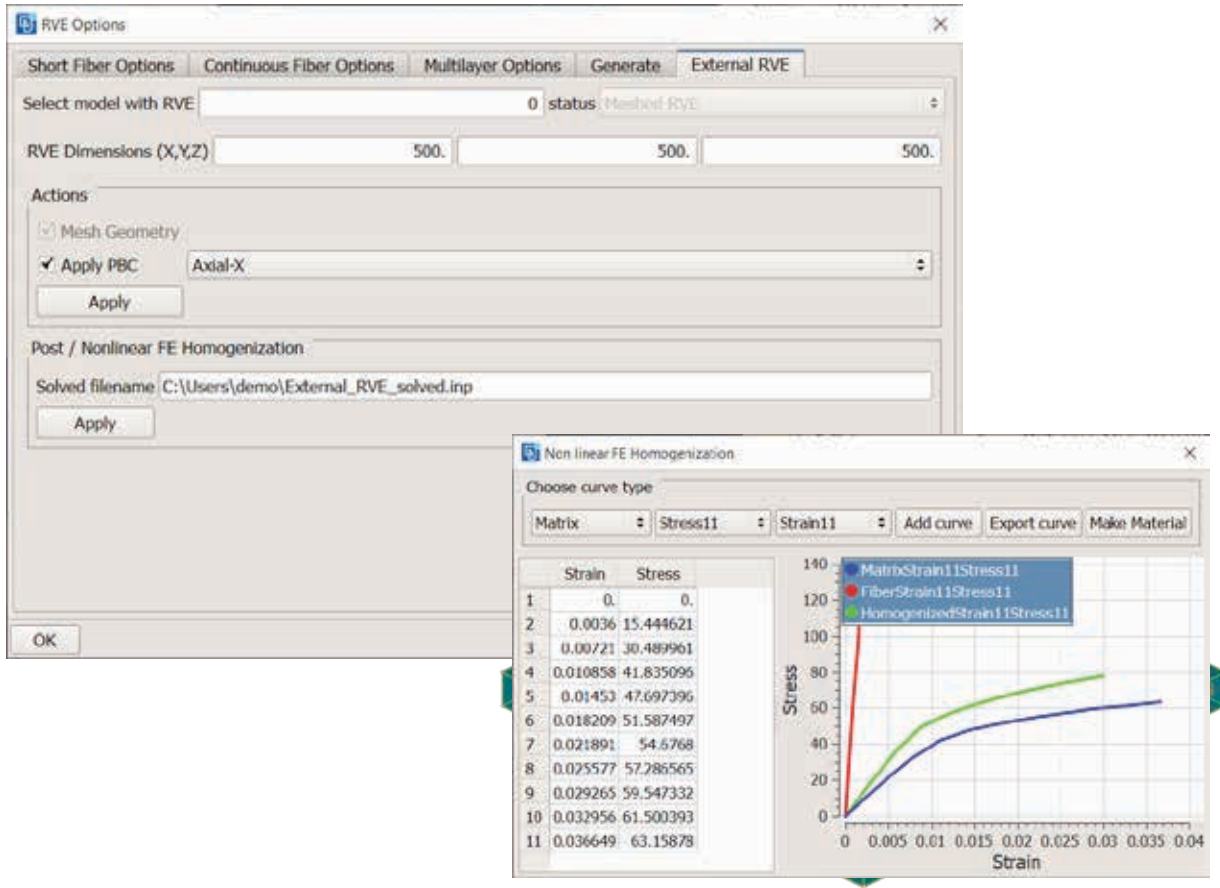


Homogenization Tool. RVE Generation

- Periodic Boundary Conditions for generated RVEs
- Ready to run RVE models are created for:
 - EPILYSIS
 - Nastran
 - Abaqus
 - Ansys
 - LS-DYNA (Implicit)
 - PAM-CRASH (Implicit)

Composites

v22.1.0



Homogenization Tool: RVE

- External RVE Model treatment
- Pre:
 - Mesh Geometry
 - Apply Periodic BCs
 - Solve with Epilysis for Linear FE Homogenization
- Post:
 - Nonlinear FE Homogenization from solved RVE models

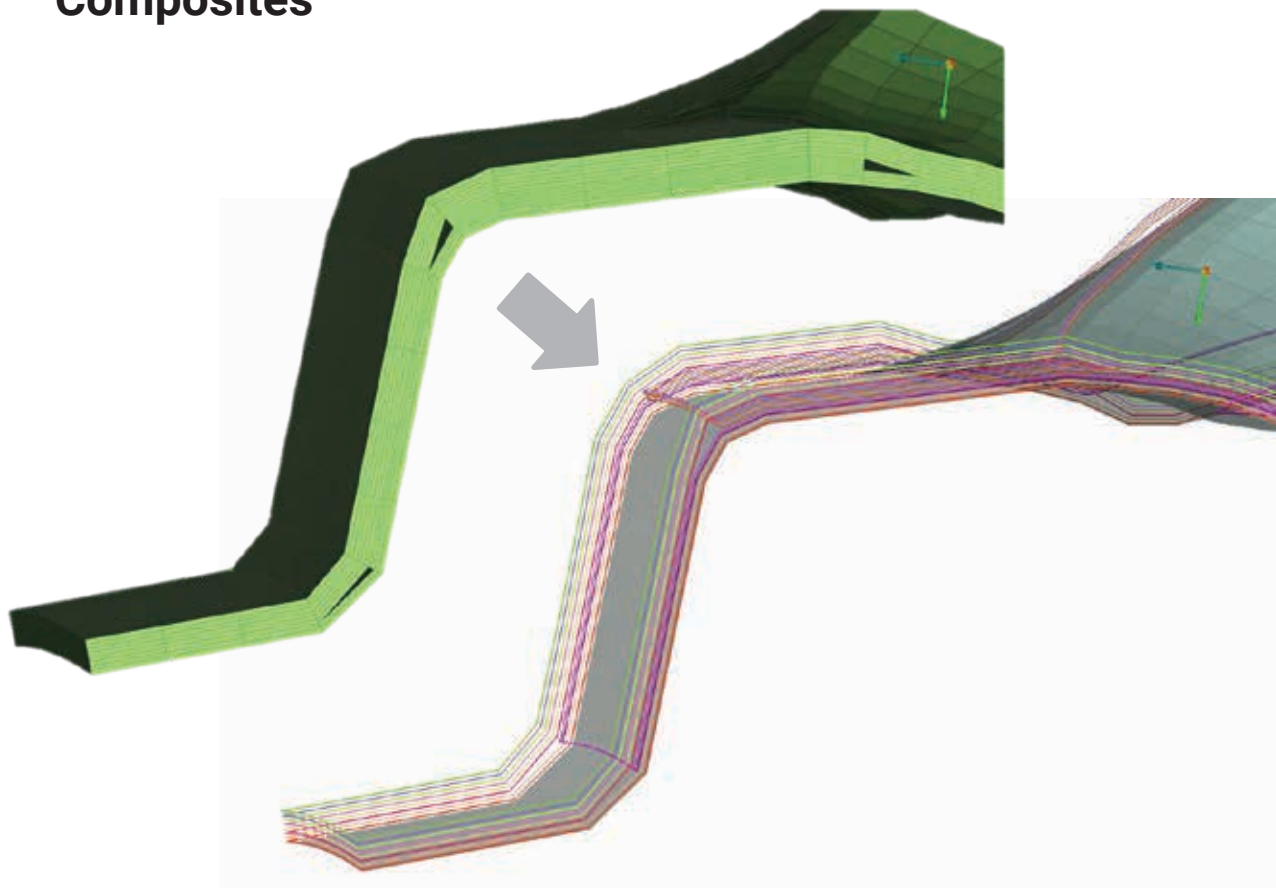
DAY 2 THURSDAY JUNE 15, 2023 - Afternoon Sessions

15:00 - 15:30

Introducing the redesigned Representative
Volume Element (RVE) Generator Tool

Vangelis Palaiokastritis

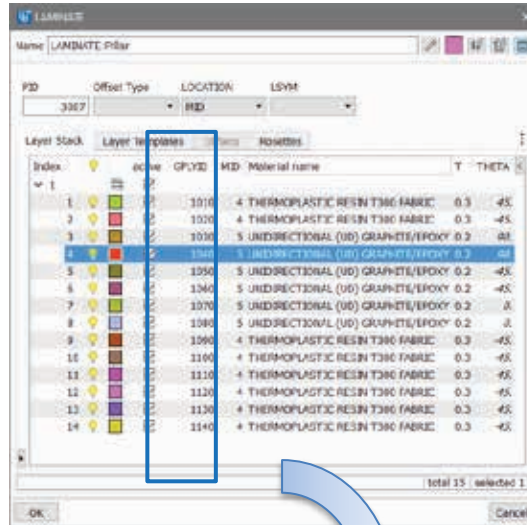
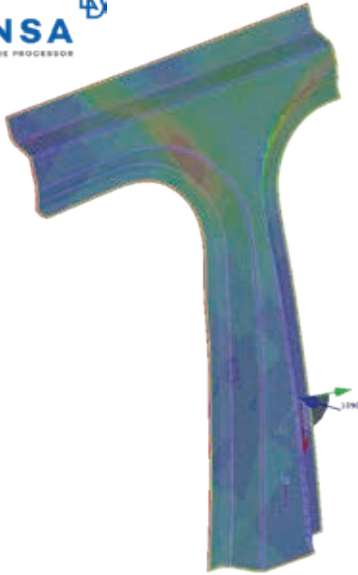
Composites



Laminate Tool: Unvolumize

- Generate shell composites from respective solid composites
- Available for both *single element* and *per ply* stacking definitions
- Accessible from Laminate Tool and Database Browser

Composites



Index	Layer Properties	Offset	PLYID	MID	Material name	T	THETA
1			1010	4	THERMOPLASTIC RESIN T300 FABRIC	0.3	45
2			1020	4	THERMOPLASTIC RESIN T300 FABRIC	0.3	-45
3			1030	5	UNIDIRECTIONAL (UD) GRAPHITE/EPOXY 0.2	0.1	0
4			1040	5	UNIDIRECTIONAL (UD) GRAPHITE/EPOXY 0.2	0.2	0
5			1050	5	UNIDIRECTIONAL (UD) GRAPHITE/EPOXY 0.2	0.2	-45
6			1060	5	UNIDIRECTIONAL (UD) GRAPHITE/EPOXY 0.2	0.2	-45
7			1070	5	UNIDIRECTIONAL (UD) GRAPHITE/EPOXY 0.2	0.2	0
8			1080	5	UNIDIRECTIONAL (UD) GRAPHITE/EPOXY 0.2	0.2	0
9			1090	4	THERMOPLASTIC RESIN T300 FABRIC	0.3	-45
10			1100	4	THERMOPLASTIC RESIN T300 FABRIC	0.3	-45
11			1110	4	THERMOPLASTIC RESIN T300 FABRIC	0.3	-45
12			1120	4	THERMOPLASTIC RESIN T300 FABRIC	0.3	-45
13			1130	4	THERMOPLASTIC RESIN T300 FABRIC	0.3	-45
14			1140	4	THERMOPLASTIC RESIN T300 FABRIC	0.3	-45

v23.1.0

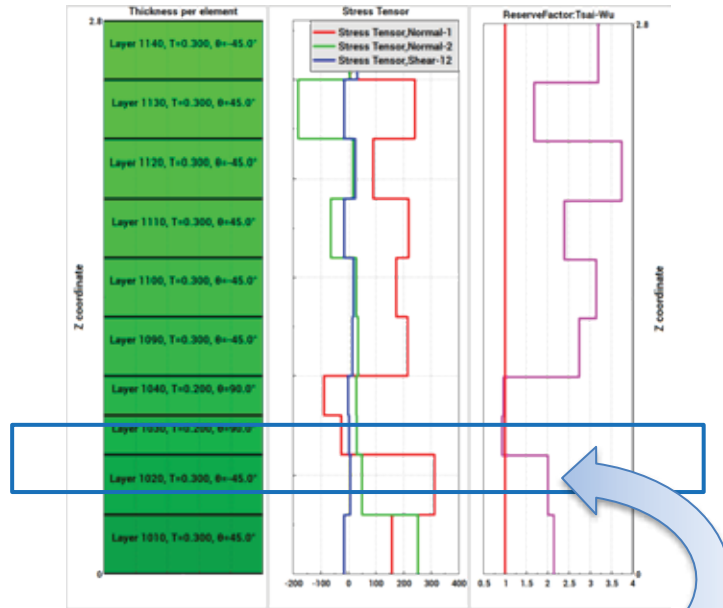
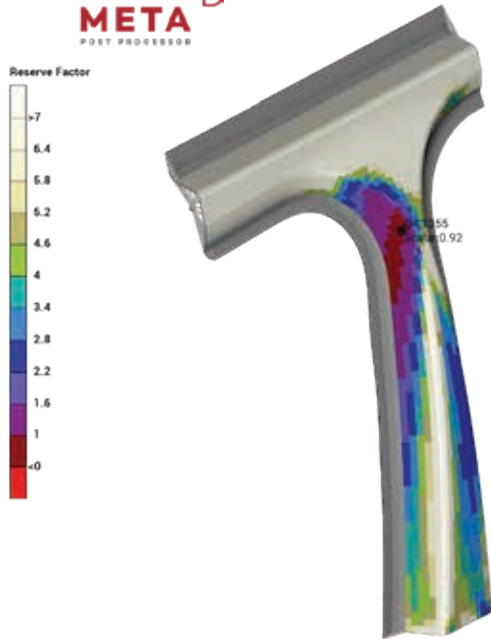
Full support of Ansys Laminates

- Lamination information through ANSA comments inside the Ansys .cdb
- Input: Recreate initial laminate structures

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ANSA Comments

Composites

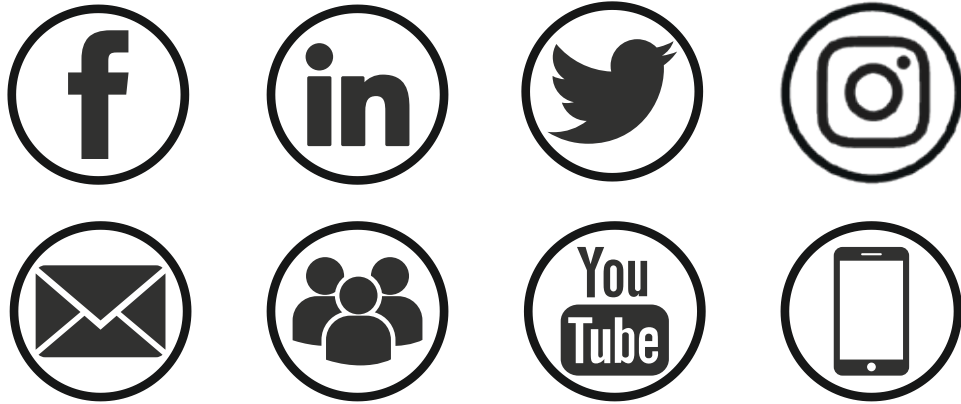


Mapping composite results to Ansys Laminates

- Retrieve Lamination information from ANSA comments inside the Ansys .cdb
- Recreate initial laminate structures

```
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ANSA Comments



Stay connected