Webinar:
What's New in Femap 2020.2
July 30th, 2020

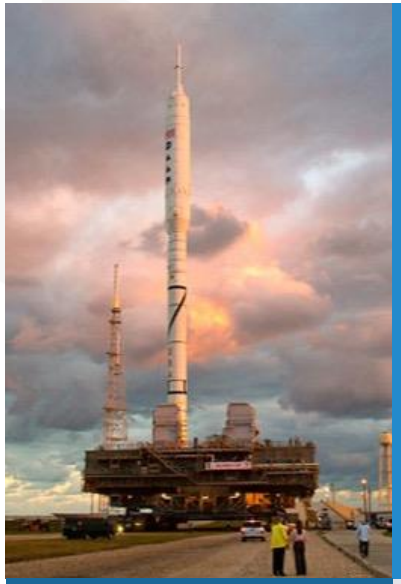
Host:
Jonathan Hill
ATA Engineering, Inc.

Presenter:
Andy Haines
Siemens Digital Industries Software

ATA ENGINEERING, INC.
13290 Evening Creek Drive S, San Diego CA 92128
(858) 480-2000
www.ata-e.com
ata-engineering
@ATAEngineering

ATA Provides High-Value Engineering Services With Expertise in Design, Analysis, and Test

ATA Engineering helps to overcome product design challenges across a range of industries



Aerospace

Robotics & Controls

Themed Entertainment

Defense

Industrial & Mining Equipment

Consumer Products

ATA is a Value-Added Reseller for Siemens Digital Industries Software

ATA offers training, free resources, and hotline support for a variety of Siemens products.

SIEMENS
Ingenuity for life

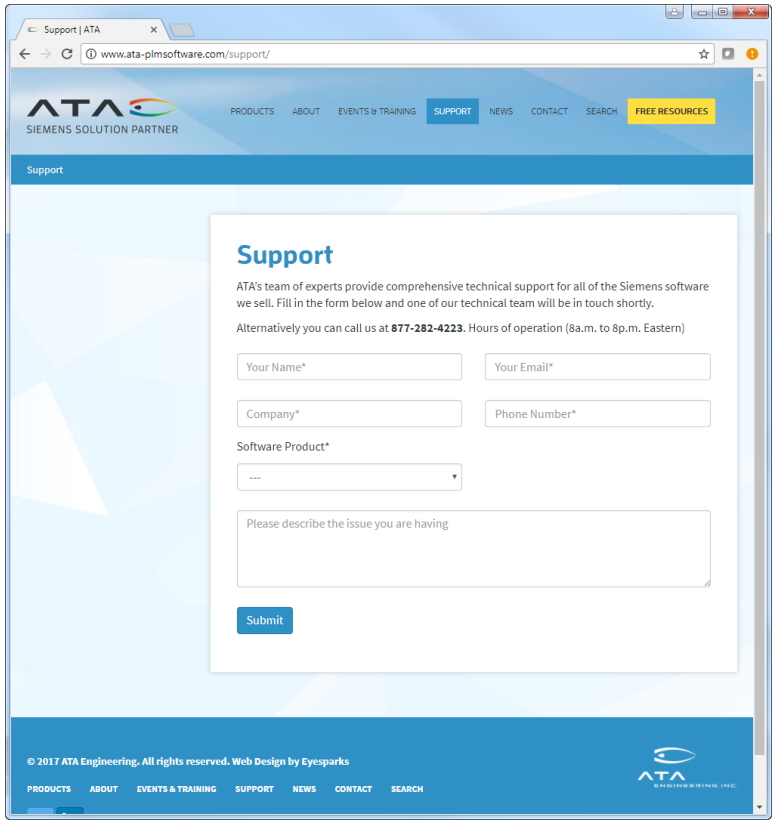
- Siemens product lines we support include:
  - Simcenter STAR-CCM+
  - Simcenter Femap
  - Simcenter Nastran (formerly NX Nastran)
  - Simcenter 3D
  - NX CAD & CAM
  - Teamcenter
  - Solid Edge
- Contact the hotline at 877-ATA-4CAE or http://ata-plmsoftware.com/support
- Developer of the official Simcenter Nastran training materials
- Preferred North American provider of Simcenter Nastran training
- Recognized as Smart Expert Partner with validated expertise in Femap, STAR-CCM+, and Simcenter 3D

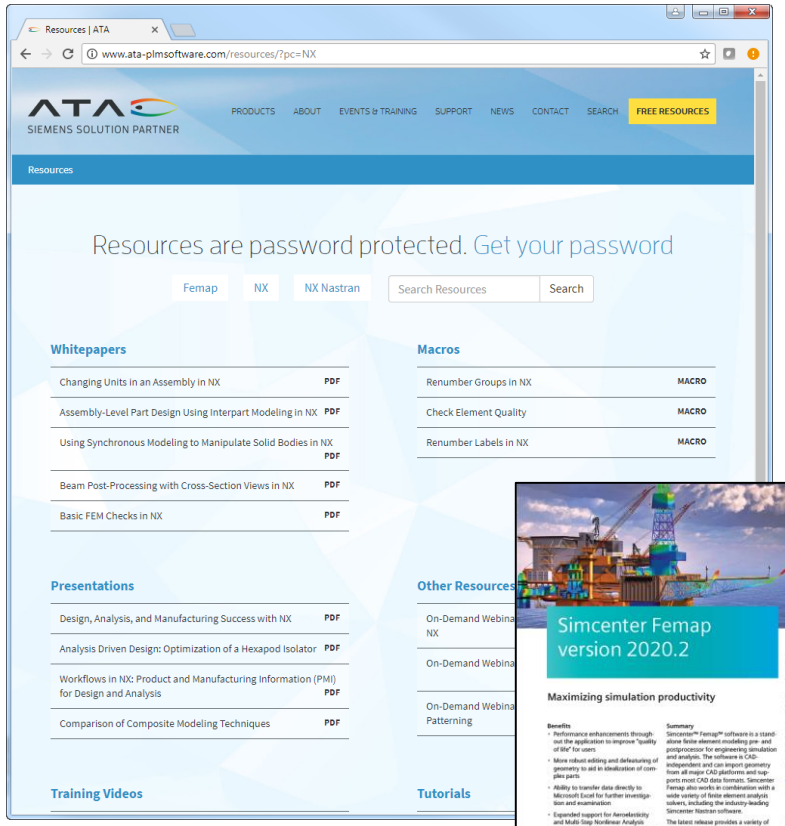
ATA ENGINEERING, INC.

Solution Partner
Smart Expert
Digital Industries Software
SIEMENS

Visit Our Website for Product Information and Free Resources

www.ata-plmsoftware.com





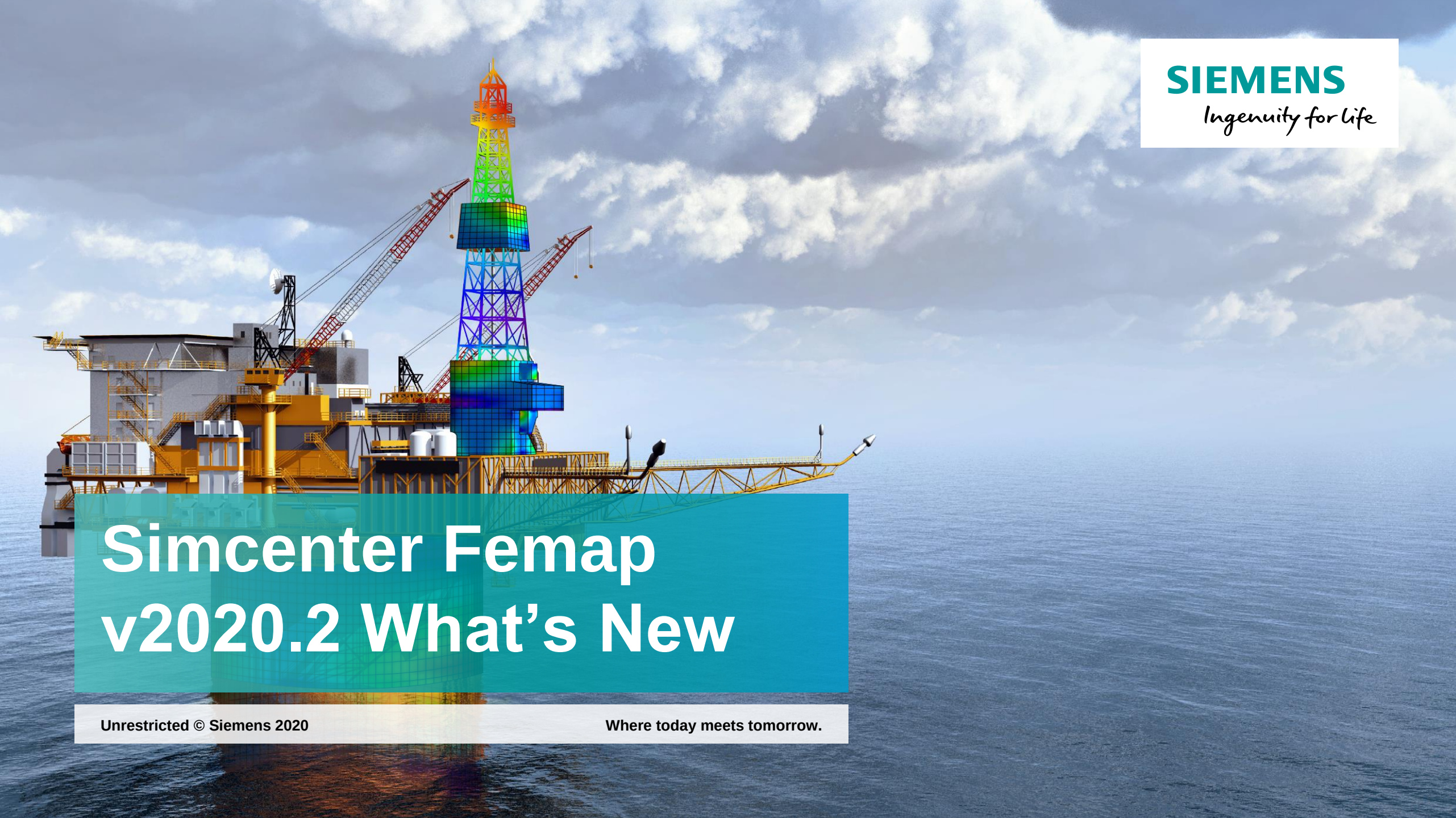
ATA ENGINEERING, INC.

Webinar:
What's New in Femap 2020.2
July 30th, 2020

Host:
Jonathan Hill
ATA Engineering, Inc.

Presenter:
Andy Haines
Siemens Digital Industries Software

ATA ENGINEERING, INC.
13290 Evening Creek Drive S, San Diego CA 92128
(858) 480-2000
www.ata-e.com
ata-engineering
@ATAEngineering



SIEMENS
Ingenuity for life

Simcenter Femap v2020.2 What's New

Unrestricted © Siemens 2020

Where today meets tomorrow.

Simcenter Femap Direction

SIEMENS
Ingenuity for life

35+ Years Dedicated to the Needs of the FEA Analyst!

Maximize efficiency of FEA tasks

- Efficient creation of high fidelity FE models that accurately represent real-world engineering problems
- Intuitive interpretation of analysis results to improve the design and performance of engineered products

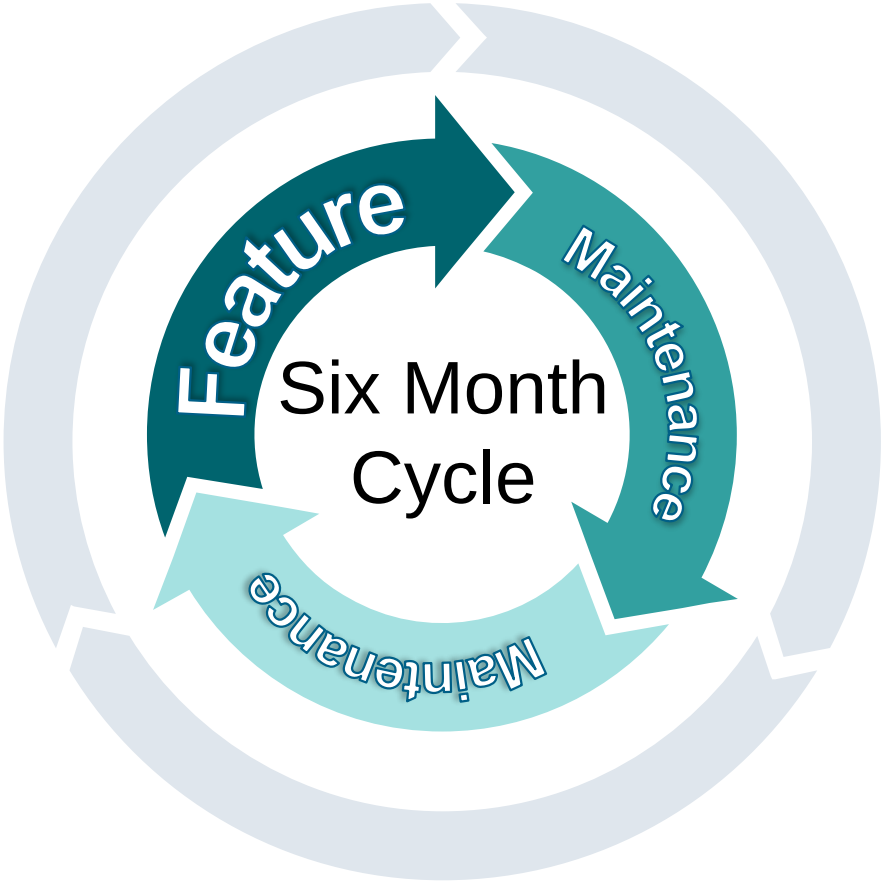
Build upon strong Simcenter Femap capabilities

- Geometry idealization and processing for FE models
- Powerful meshing, model creation and interactive editing
- In-depth support for industry standard solvers
- Flexible customization tools to streamline analysis processes

Unrestricted © Siemens 2020

Simcenter Femap Roadmap – Update Release Cadence

SIEMENS
Ingenuity for life



Feature Release Every Six Months
Database Change, UI Updates including Localization, Licensing Updates – April - October

Maintenance Release – If Required
Database, UI, Licensing Unchanged – Bug Fixes/Critical Updates Only

Maintenance Release – If Required
Database, UI, Licensing Unchanged – Bug Fixes/Critical Updates Only

Unrestricted © Siemens 2020

Simcenter Femap Roadmap – Update Release Cadence

SIEMENS
Ingenuity for life

Feature Release – April/October

- New Features
- Expanced Functionality
- Database Changes
- API Expansion
- Will Require Licensing Update, Localization Update

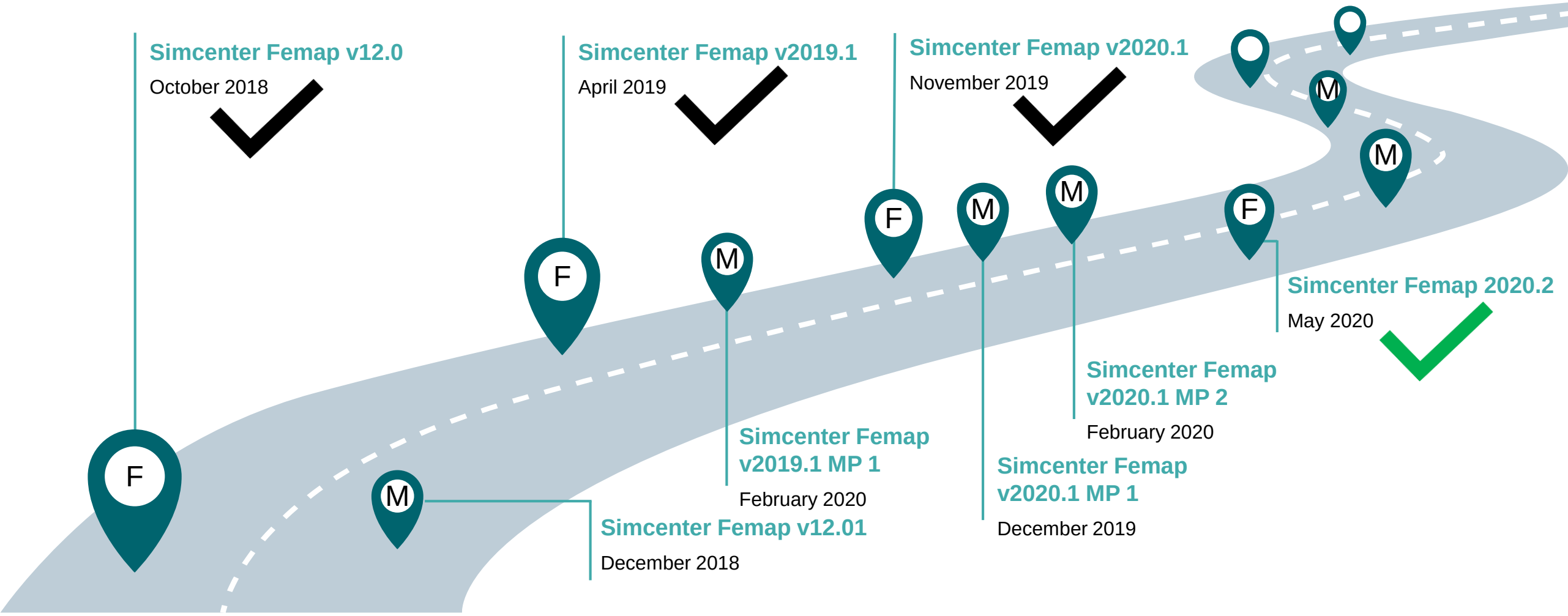
Maintenance Release

- Bug Fixes
- Minor Enhancements without User Interface Changes
- Working to Modernize Installer – Maintenance Releases as Patches, not full Installs
- Simcenter Nastran Update

Unrestricted © Siemens 2020

Simcenter Femap v12.0 and Beyond Roadmap

SIEMENS
Ingenuity for life



Unrestricted © Siemens 2020

Agenda:

Performance Improvements

UI and Visualization

Preprocessing

Meshing

Post Processing

Solver Support

Miscellaneous

Simcenter Femap v2020.2 – What's New
Performance Improvements

SIEMENS
Ingenuity for life

- Connect->Automatic command
  - **3x-5x** improvement in models with a large number of connections

- Geometry, Copy/Rotate/Reflect: Mesh, Copy/Rotate/Reflect; and Move commands
  - Significant improvements have been made to both the copy/move phase of these commands and the redrawing phase

  - Most noticeable improvement will be in large models when copying small portions of the model…potentially **40x** faster.

- Length-based operations on Curves
  - Impacts Mesh Sizing and Coordinate methods such as Along Curve, Length Along and Midpoint by making these methods both Faster and More Accurate

  - Mesh Sizing **2x-3x** faster on large model

Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Performance Improvements

SIEMENS
Ingenuity for life

- Commands which can be "Aborted"
  - Many Checking and Listing commands can be aborted while doing computations or listing results.
  - Anywhere from **2x-100x** improvement in speed of these commands with only slightly slower abort reaction time
  - Largest improvements in the Tools->Check and Tools->Mass Properties commands

- Output Process
  - **30%+** improvement in the Envelope, Linear Combinations, and RSS combinations

- Nastran Model Read
  - Almost **2x** improvement in importing large input files

- ANSYS Results Read
  - **2x-3x** improvement when reading results from non-compressed RST files

Unrestricted © Siemens 2020

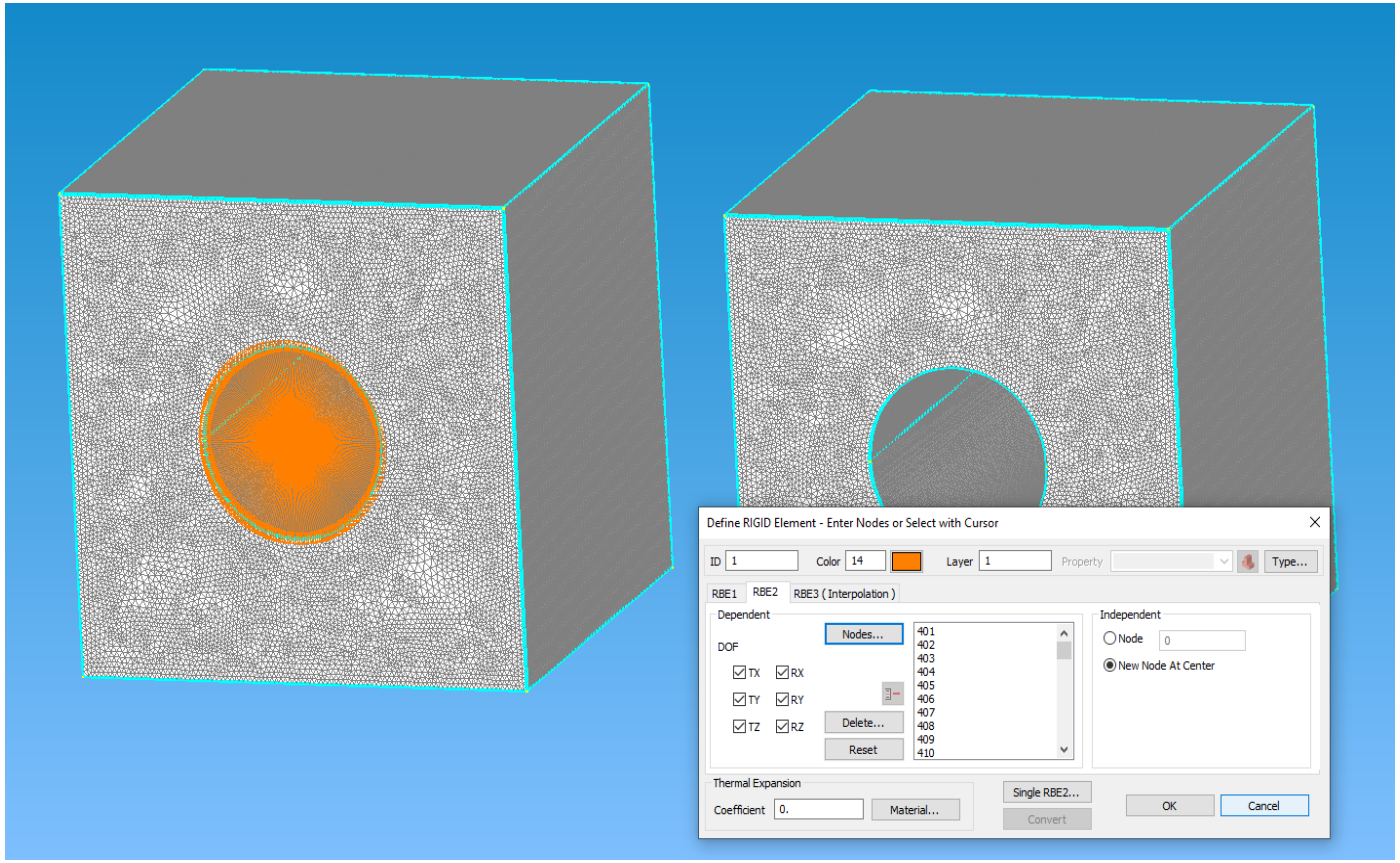
Simcenter Femap v2020.2 – What's New
Performance Improvements – Graphics

SIEMENS
Ingenuity for life

- Performance
  - Entity creation (especially in PG*)
  - Minimize free face evaluation
  - Minimize full graphics regenerations

- Creating a single entity when the model is already large was slow in PG*.
  - Creating a single rigid element in a model with 3.3 million 10-noded tetrahedral elements took **29** seconds in 2020.1, but now takes **0.3** seconds (**~95x** improvement)

- Some improvement to entity copy in large models but not as significant as in creation



*PG = Performance Graphics in Simcenter Femap

Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Performance Improvements – Graphics

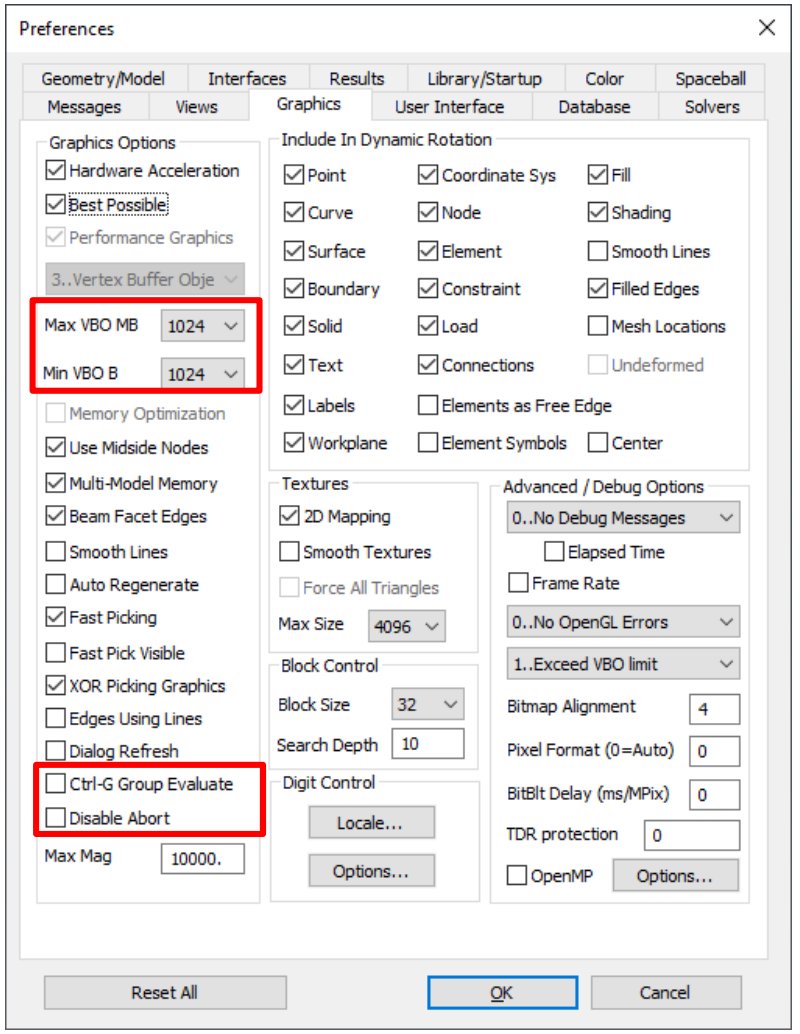
SIEMENS
Ingenuity for life

- Added *Crtl-G Group Evaluate* option to *Graphics* tab of File->Preferences, which performs Group->Operations-> Evaluate on all groups currently visible when using Window-> Regenerate (Ctrl+G Shortcut Key). Helps when creating entities into the displayed group.

- Added *Disable Abort* option to *Graphics* tab of File->Preferences to disable checking for user aborts while drawing

- *Max VBO MB* and *Min VBO B* are available to specify when *Best Possible* is enabled

- Improved performance of thumbnail generation for large models from 30 seconds to 10 seconds



Unrestricted © Siemens 2020

Agenda:

Performance Improvements

UI and Visualization

Preprocessing

Meshing

Post Processing

Solver Support

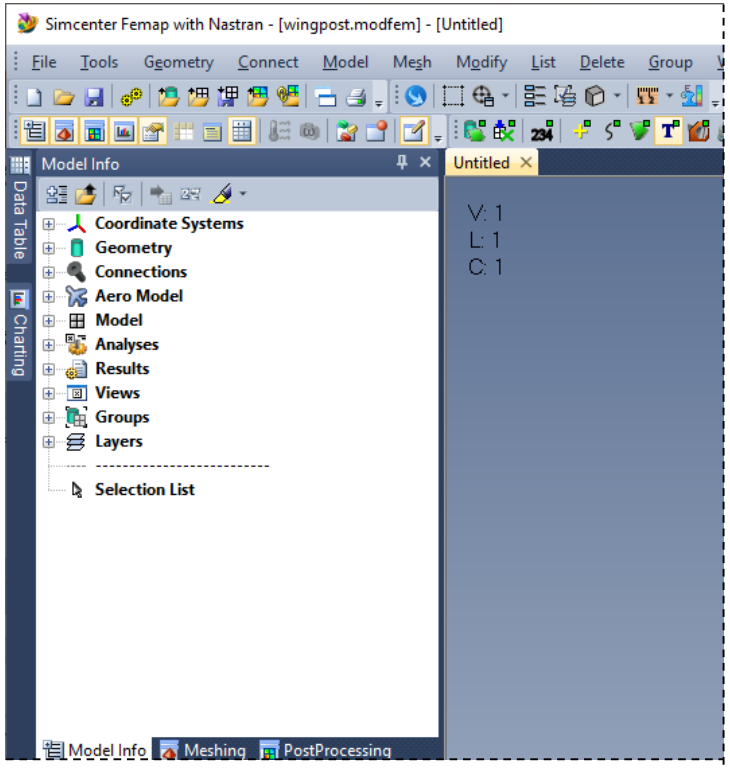
Miscellaneous

Simcenter Femap v2020.2 – What's New
UI and Visualization – High DPI Support

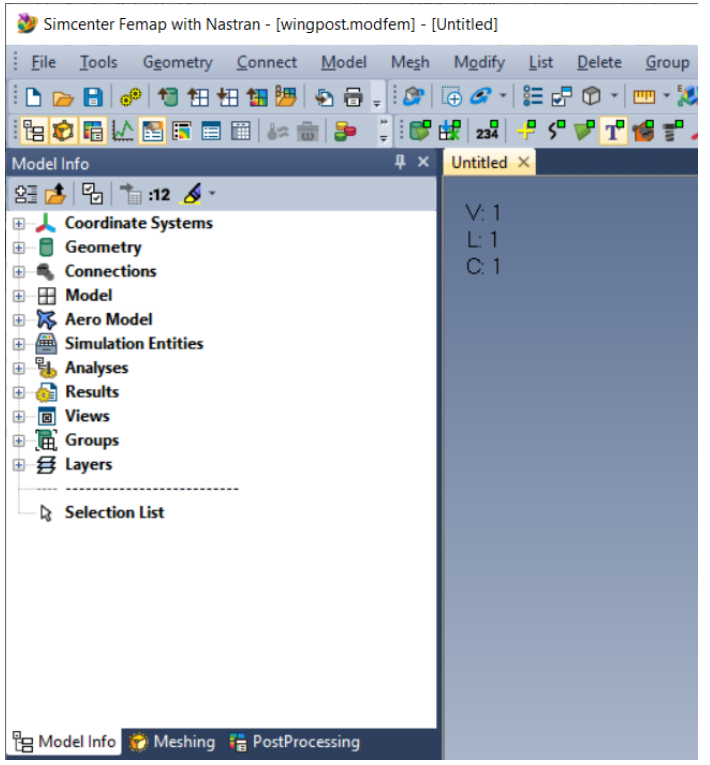
SIEMENS
Ingenuity for life

New Icons

- Icons were redrawn with a modern style and color palette
  - Colors selected to provide enhanced contrast making selection easier
  - Consistent theme throughout Femap
- Designed to maximize familiarity to minimize learning curve



Old



New

Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
UI and Visualization – High DPI Support

SIEMENS
Ingenuity for life

New Icons – All 1600+ Completed in v2020.2!

- Vector assets of all icons allow for Femap to fully support high resolution (4K) displays
- UI scaling - Full high DPI support in 2020.2 now available!!!
- Other options can be set with Preference:
  - Disabled – Femap is drawn at 100% resolution, however text and icons can be small and hard to read
  - Handled by Windows – Femap is scaled at the Windows scaling setting via extrapolation; leads to blurry text and

blurry text and icons

Example icons

100%

150%

200%

100%

150%

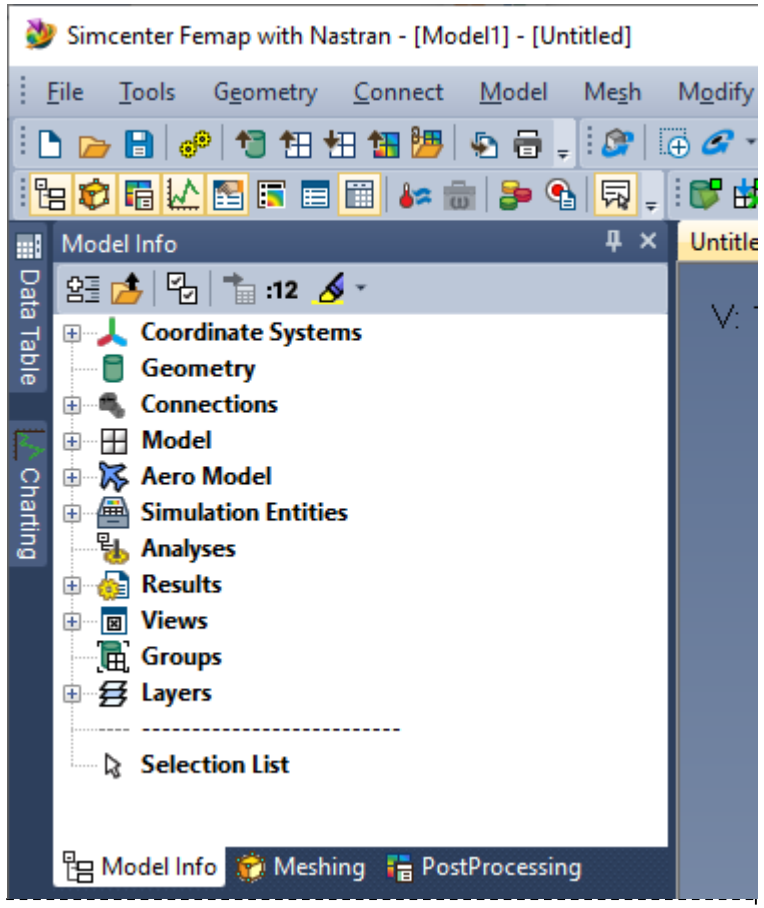
200%

Unrestricted © Siemens 2020

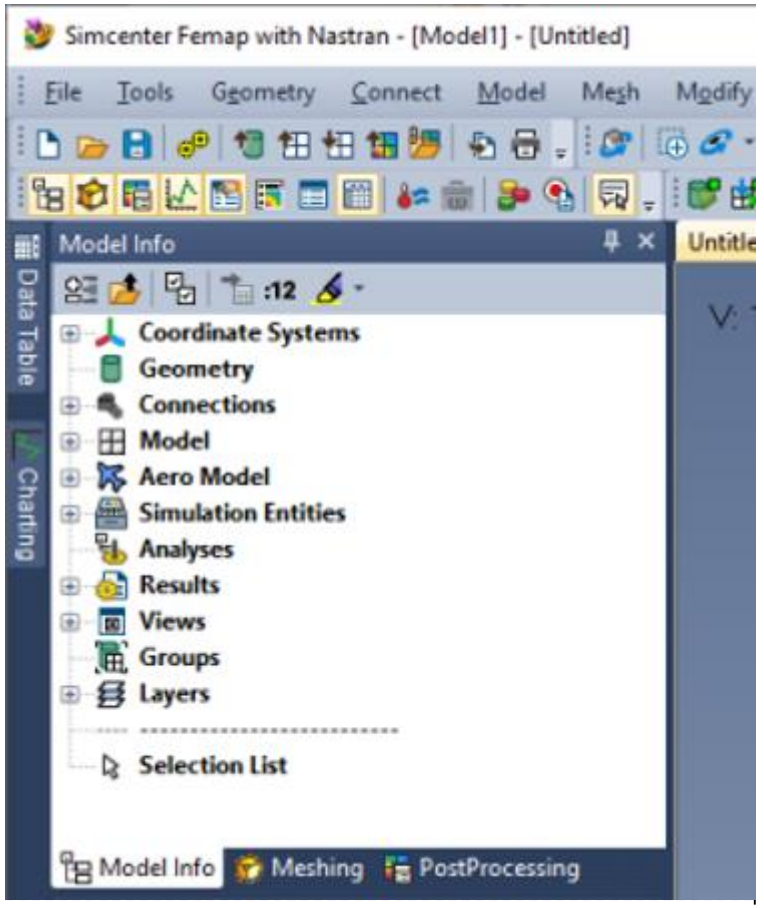
Simcenter Femap v2020.2 – What's New
UI and Visualization – High DPI Support

SIEMENS
Ingenuity for life

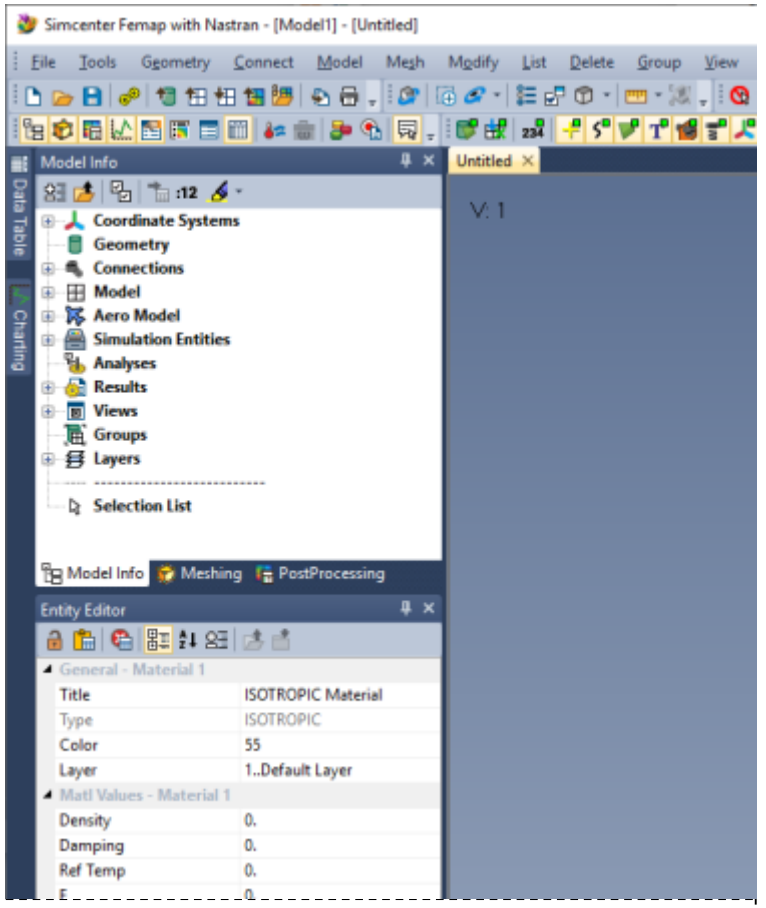
High DPI Support – v2020.2 examples on 4k monitor



High DPI Aware



Windows Native Scaling



No Scaling

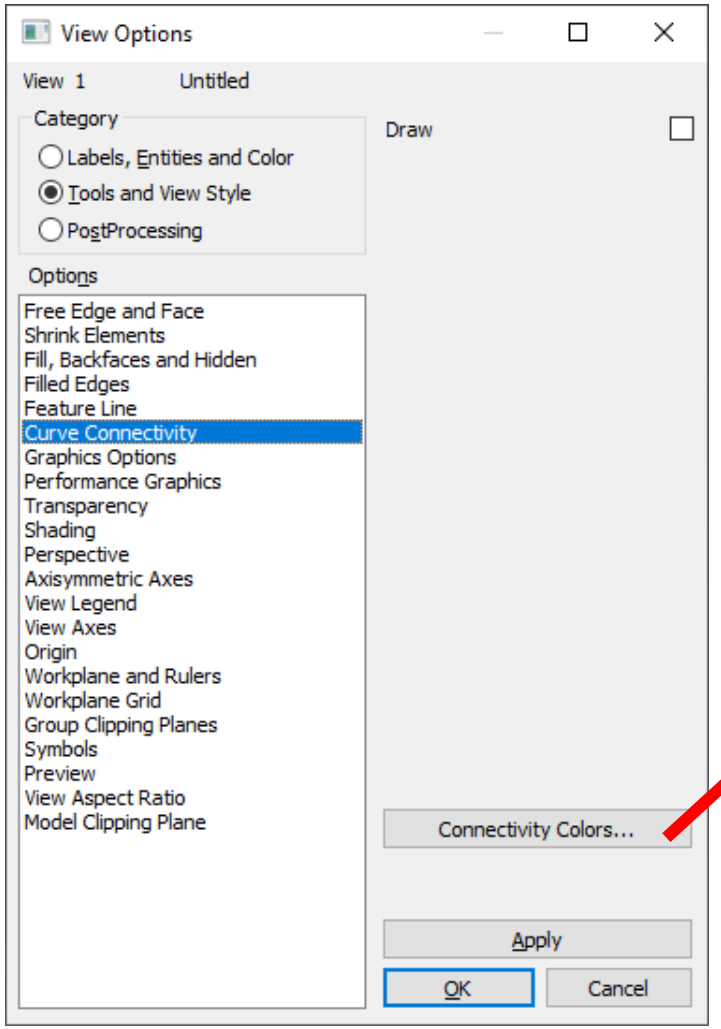
Unrestricted © Siemens 2020

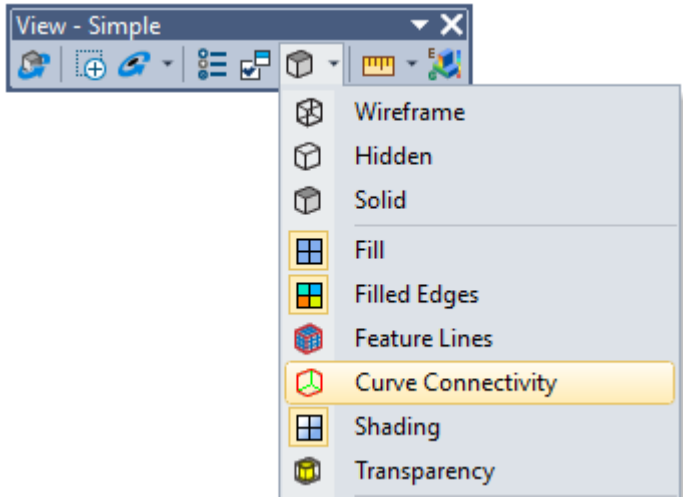
Simcenter Femap v2020.2 – What's New
UI and Visualization – Curve Connectivity

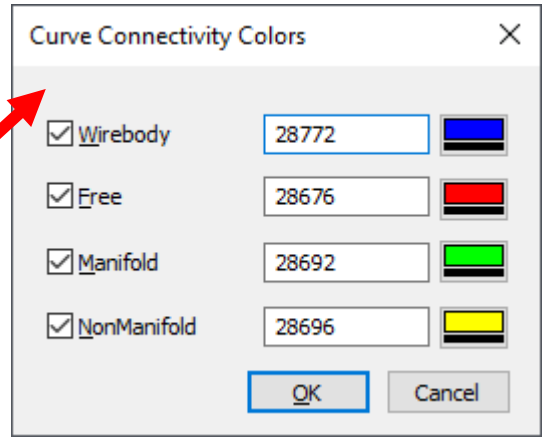
SIEMENS
Ingenuity for life

Curve Connectivity in View->Options colors Curves by level of connectivity

- Override curve color based on surface connectivity
  - Free – 1 surface attached
  - Manifold – 2 surfaces attached
  - NonManifold – more than 2 surfaces attached or "T-junction"
  - Wirebody - 0 surfaces attached (not common as Wirebody entities cannot be created in Femap)





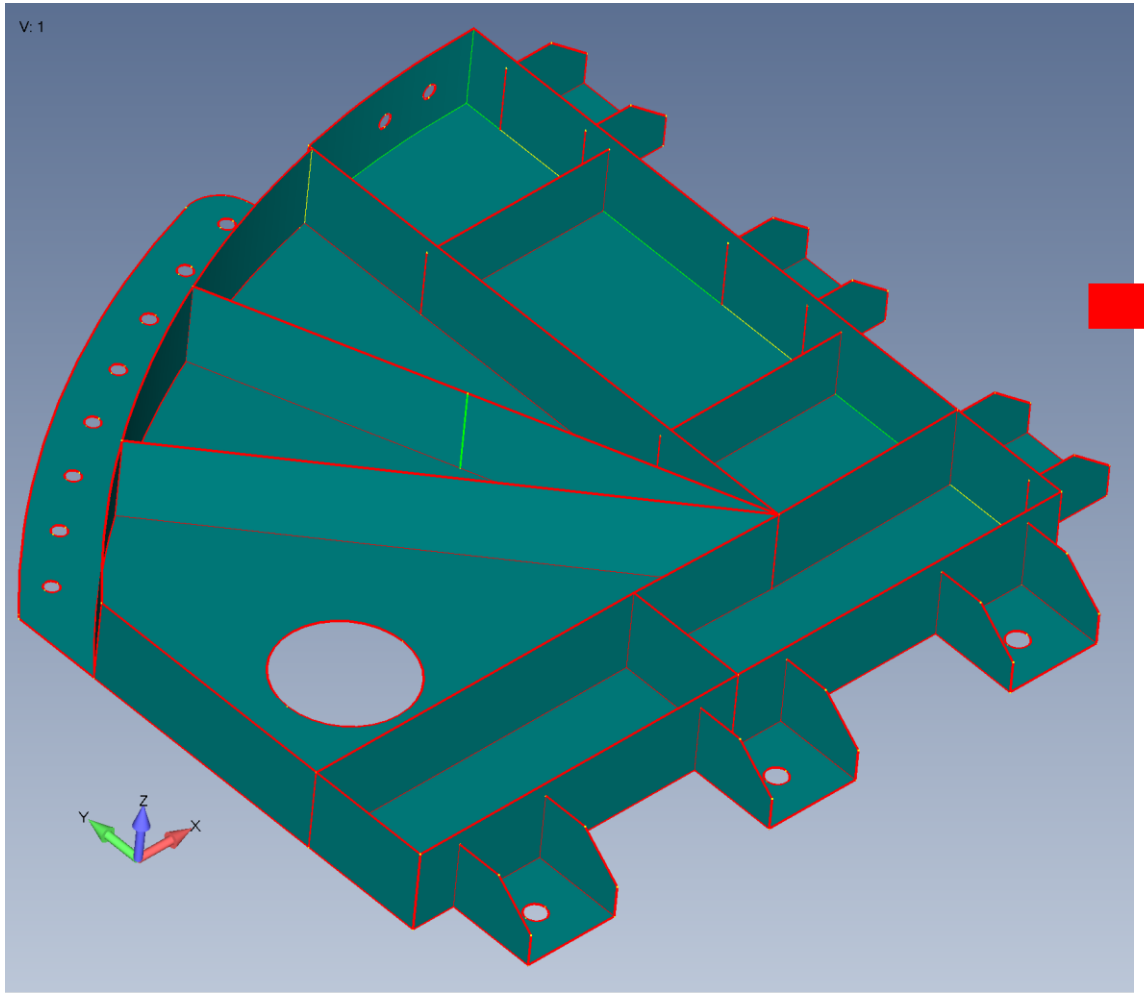


Unrestricted © Siemens 2020

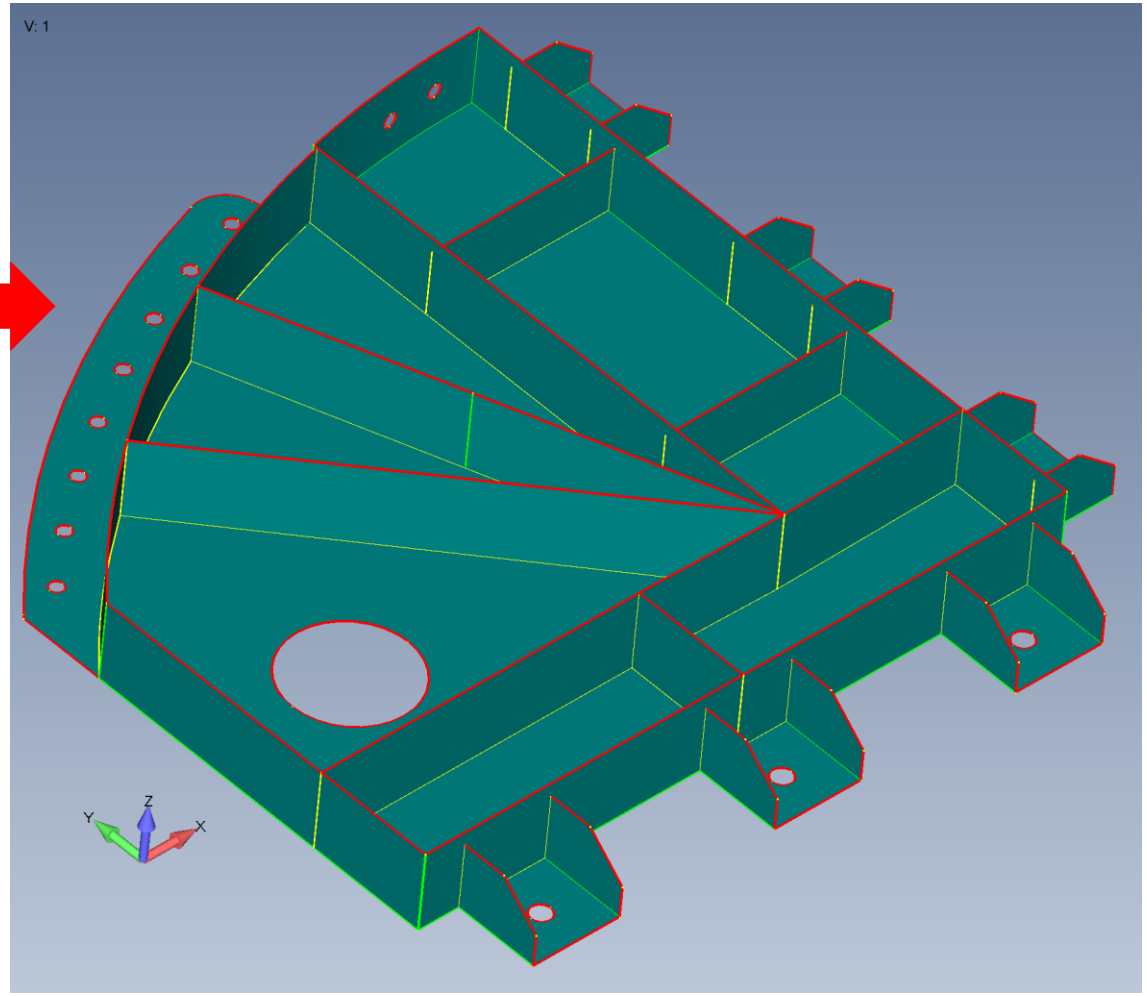
Simcenter Femap v2020.2 – What's New
UI and Visualization – Curve Connectivity

SIEMENS
Ingenuity for life

Before NonManifolod Add – No NonManifold Curves Exist



After NonManifolod Add – NonManifold Curves Shown in Yellow



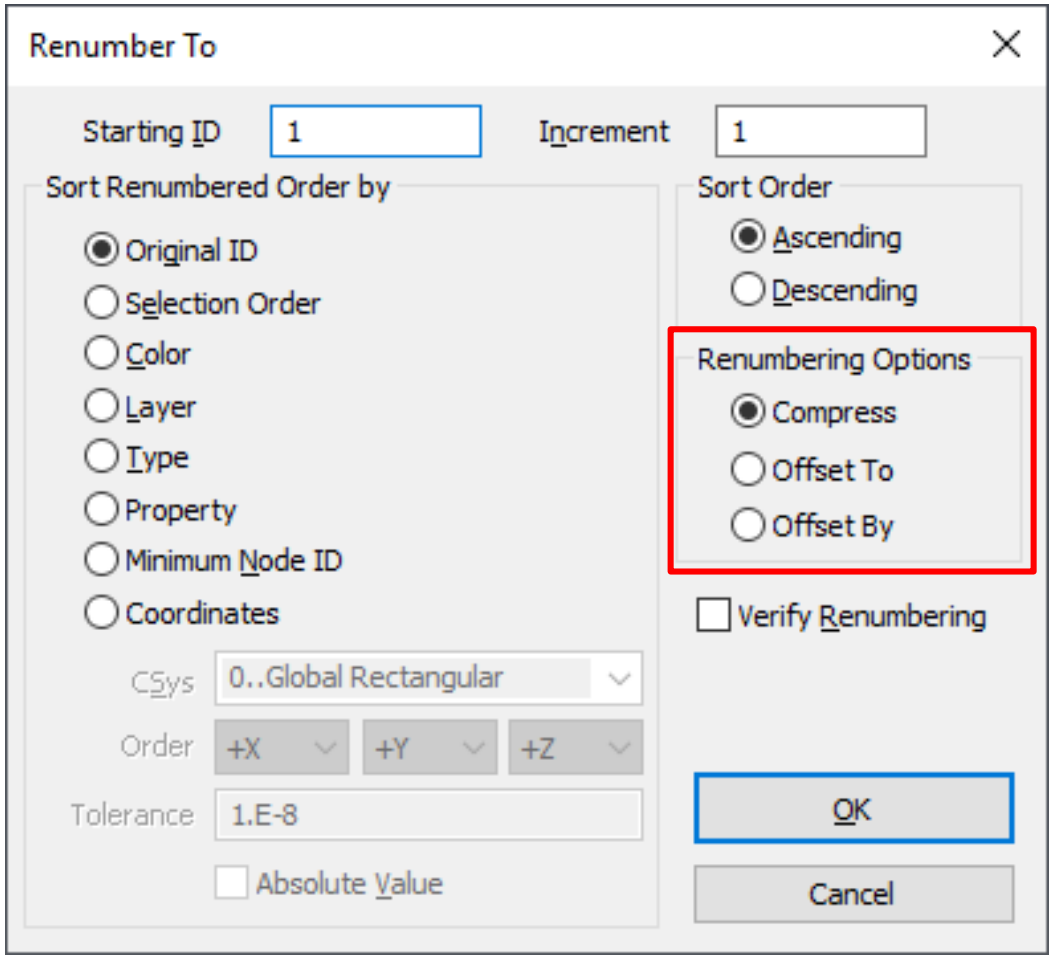
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
UI and Visualization – Renumbering

SIEMENS
Ingenuity for life

Improved Renumbering commands to provide better control when choosing to offset IDs

- Replaced old "Constant Offset" option with new *Renumbering Options* section
  - *Compress* – Specify *Starting ID* and optionally *Increment*
  - *Offset To* – Specify *Starting ID*
  - *Offset By* – Specify *ID Offset*

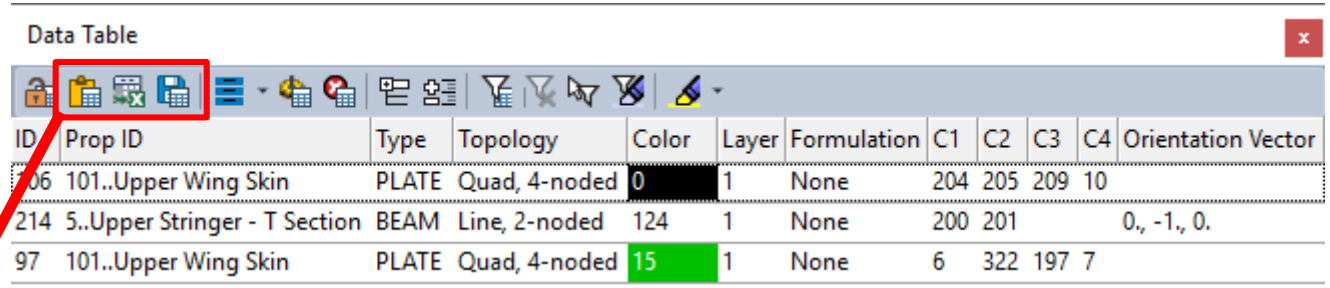


Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
UI and Visualization – Copy/Save Formats

SIEMENS
Ingenuity for life

Enhanced *Copy to Clipboard* and *Save to File* commands for the *Data Table*, *Connection Editor*, *Mesh Point Editor*, *Function/Table Editor* and *Entity Editor* to copy/save data using formatted HTML.



ID	Prop ID	Type	Topology	Color	Layer	Formulation	C1	C2	C3	C4	Orientation Vector
106	101..Upper Wing Skin	PLATE	Quad, 4-noded	0	1	None	204	205	209	10	
214	5..Upper Stringer - T Section	BEAM	Line, 2-noded	124	1	None	200	201			0., -1., 0.
97	101..Upper Wing Skin	PLATE	Quad, 4-noded	15	1	None	6	322	197	7	

Improves formatting when pasting into Office Tools and allows viewing of saved files with standard browsers.

Unrestricted © Siemens 2020

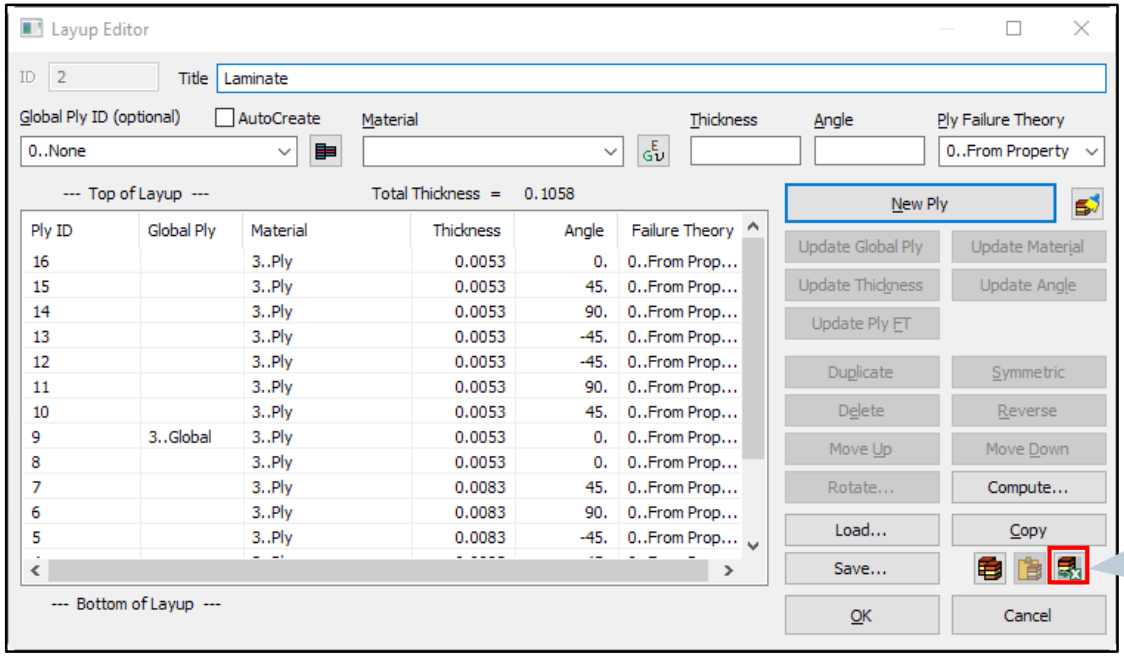
Simcenter Femap v2020.2 – What's New
UI and Visualization – Send to Excel

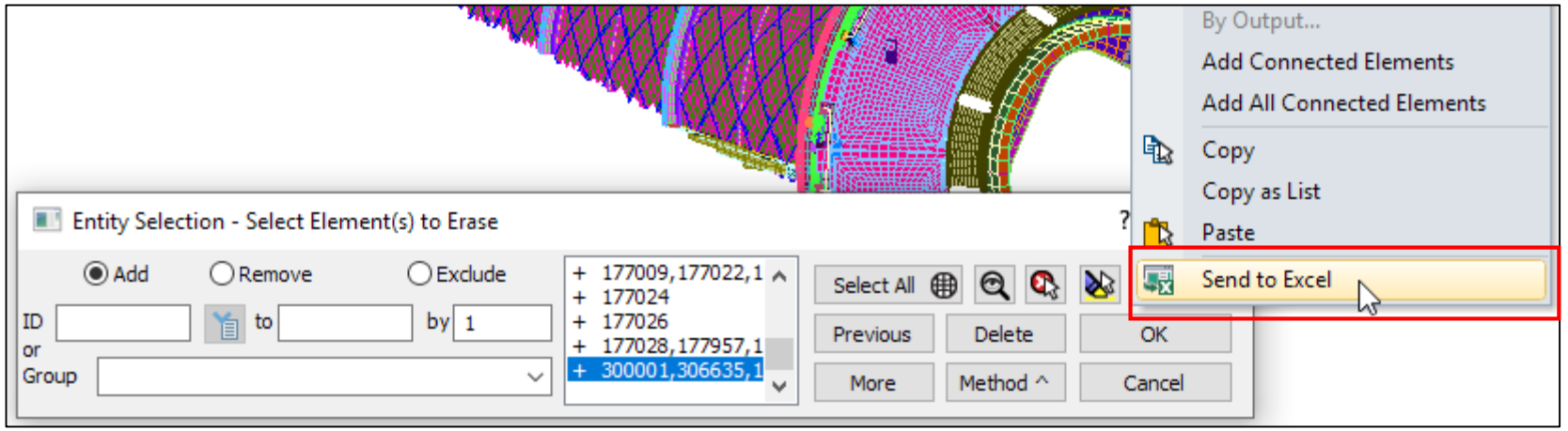
SIEMENS
Ingenuity for life

New technology in Simcenter Femap offers ability to transfer data from dialog boxes and panes directly to Microsoft Excel

Examples of dialog boxes which have *Send to Excel* commands or icons to transfer data are:

- Layup Editor
- Standard Entity Selection





Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
UI and Visualization – Send to Excel

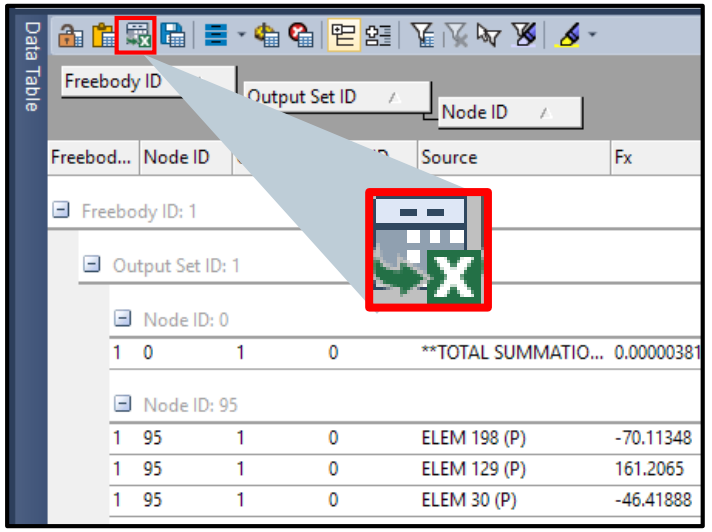
SIEMENS
Ingenuity for life

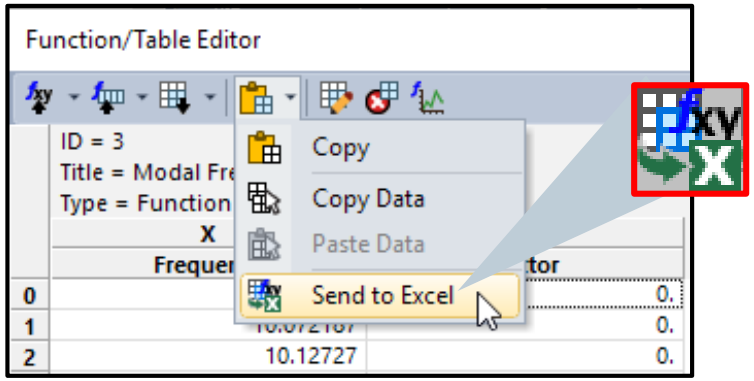
Various dockable panes in Femap are now outfitted with *Send to Excel* commands or icons

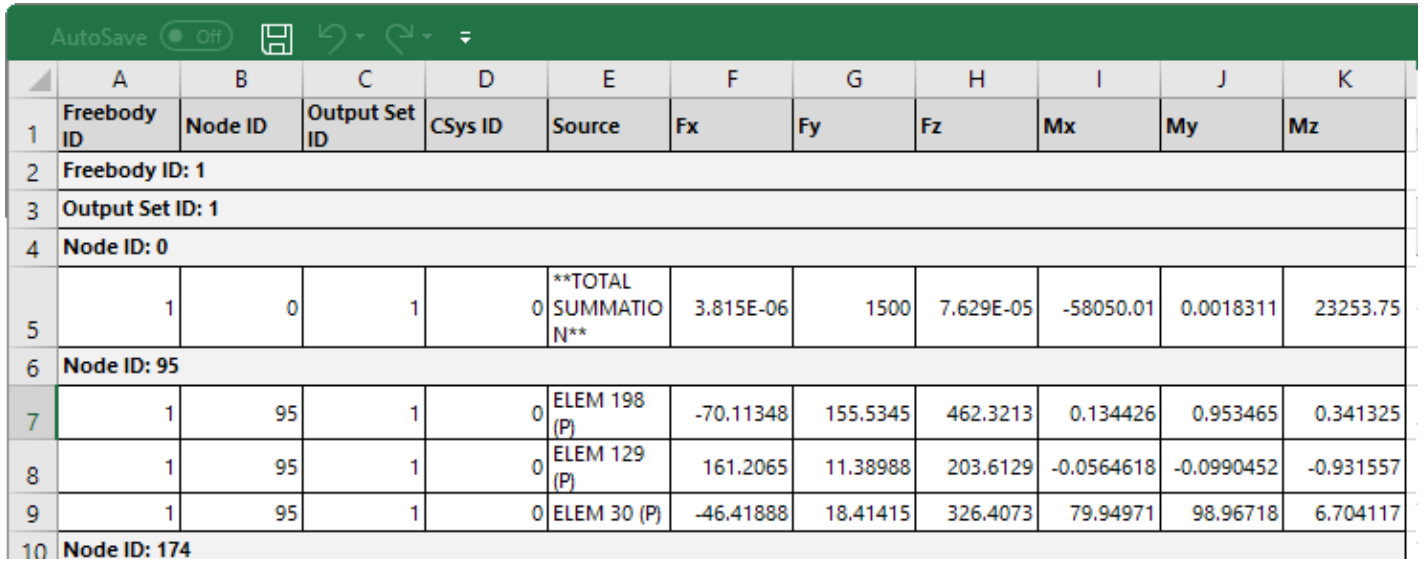
Typically located next to Copy/Save icons or on *Copy to Clipboard* menu

Data is sent with HTML Formatting

- Organized
- Clean look and feel
- Easy to manipulate column width and other features of the table







	A	B	C	D	E	F	G	H	I	J	K
1	Freebody ID	Node ID	Output Set ID	CSys ID	Source	Fx	Fy	Fz	Mx	My	Mz
2	Freebody ID: 1										
3	Output Set ID: 1										
4	Node ID: 0										
5	1	0	1	0	**TOTAL SUMMATION**	3.815E-06	1500	7.629E-05	-58050.01	0.0018311	23253.75
6	Node ID: 95										
7	1	95	1	0	ELEM 198 (P)	-70.11348	155.5345	462.3213	0.134426	0.953465	0.341325
8	1	95	1	0	ELEM 129 (P)	161.2065	11.38988	203.6129	-0.0564618	-0.0990452	-0.931557
9	1	95	1	0	ELEM 30 (P)	-46.41888	18.41415	326.4073	79.94971	98.96718	6.704117
10	Node ID: 174										

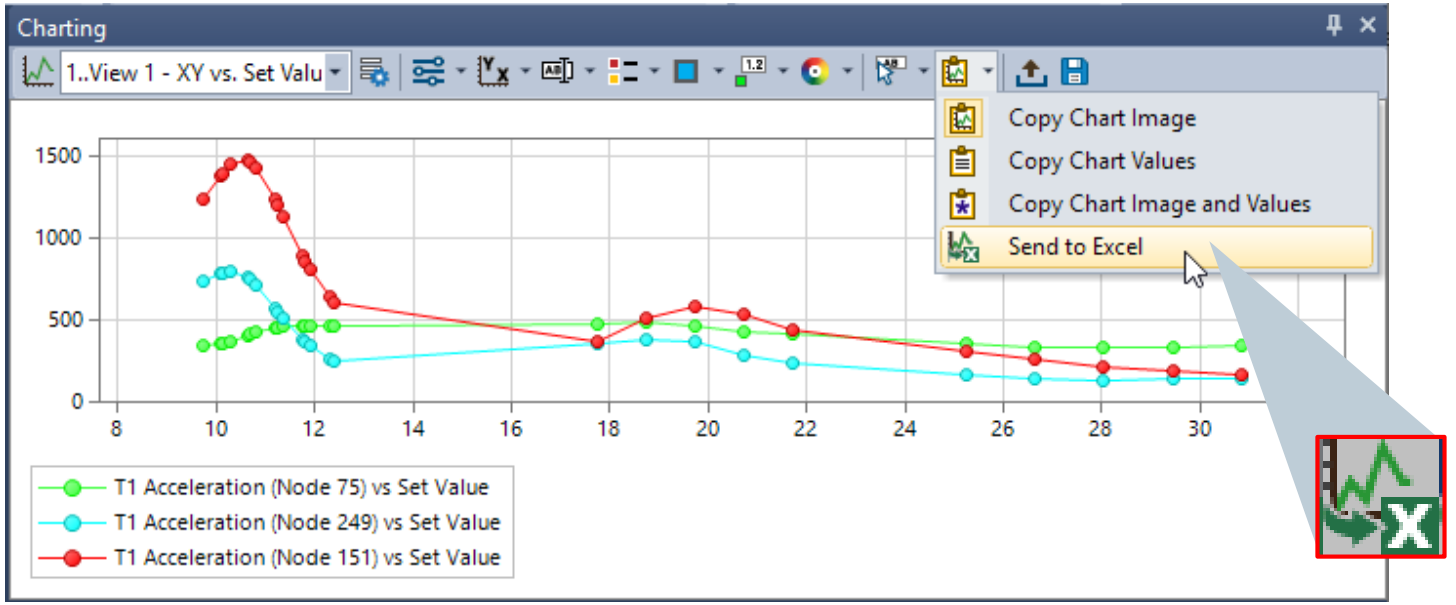
Unrestricted © Siemens 2020

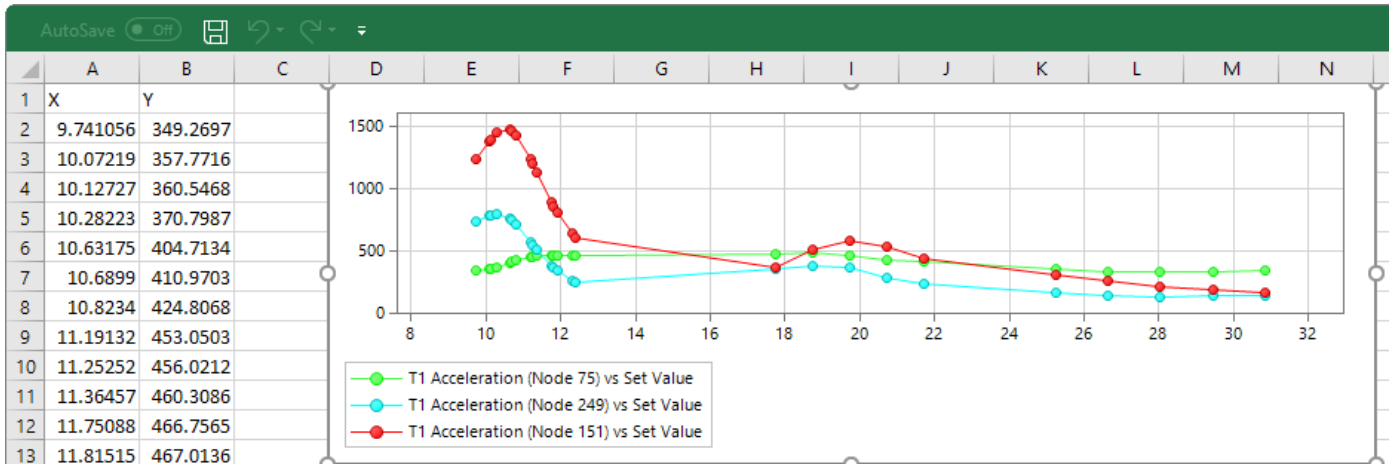
Simcenter Femap v2020.2 – What's New
UI and Visualization – Send to Excel

SIEMENS
Ingenuity for life

Send to Excel command in *Charting* pane simultaneously transfers:

- XY Data Pairs for ALL Data Series currently visible in the *Charting* pane
- Image of Chart





Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
UI and Visualization – Miscellaneous

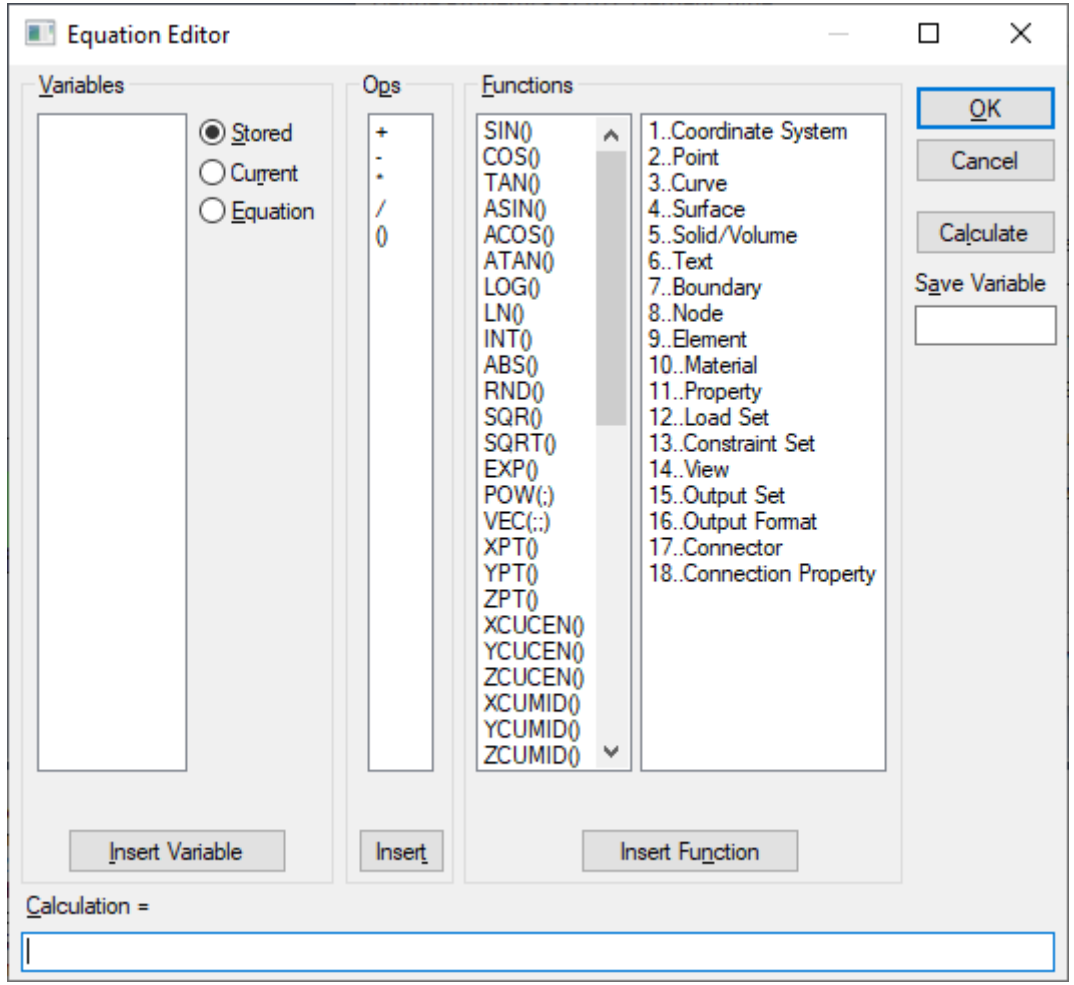
SIEMENS
Ingenuity for life

Updated *Equation Editor* dialog box to be resizable, added context-sensitive help by pressing *F1 key*, and reordered items in the *Functions* list to group similar items together.

Added ELTHK(elemID ; cornerID), which returns planar element corner thicknesses.

Updated View->Options command to automatically switch *Color Mode* to appropriate "View Color" option after using *Color Palette* to select a color, then clicking *OK*

Updated selection of solids to allow use of the *Select Visible* icon, but only selects visible solids, not "Simcenter Femap volumes"

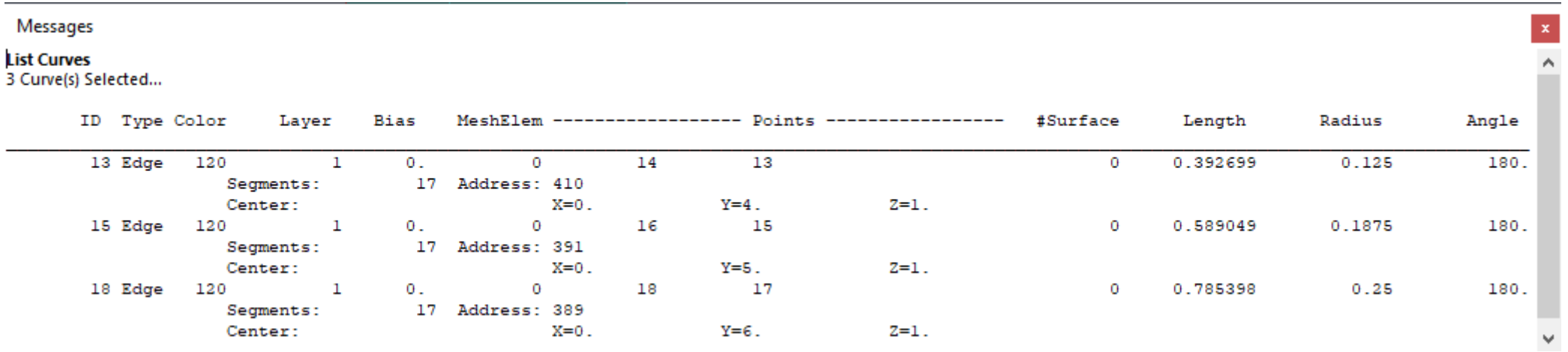


Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
UI and Visualization – Miscellaneous

SIEMENS
Ingenuity for life

Updated List->Geometry->Curve command to include Arc/Circle center coordinates when *Advanced* option is enabled.


Messages

List Curves
3 Curve(s) Selected...

ID	Type	Color	Layer	Bias	MeshElem	Points		#Surface	Length	Radius	Angle
13	Edge	120	1	0.	0	14	13	0	0.392699	0.125	180.
		Segments:		17	Address: 410						
		Center:			X=0.	Y=4.	Z=1.				
15	Edge	120	1	0.	0	16	15	0	0.589049	0.1875	180.
		Segments:		17	Address: 391						
		Center:			X=0.	Y=5.	Z=1.				
18	Edge	120	1	0.	0	18	17	0	0.785398	0.25	180.
		Segments:		17	Address: 389						
		Center:			X=0.	Y=6.	Z=1.				

Improved Model->Merge to more cleanly handle cases where user intentionally chooses to overwrite existing entities in the current model.

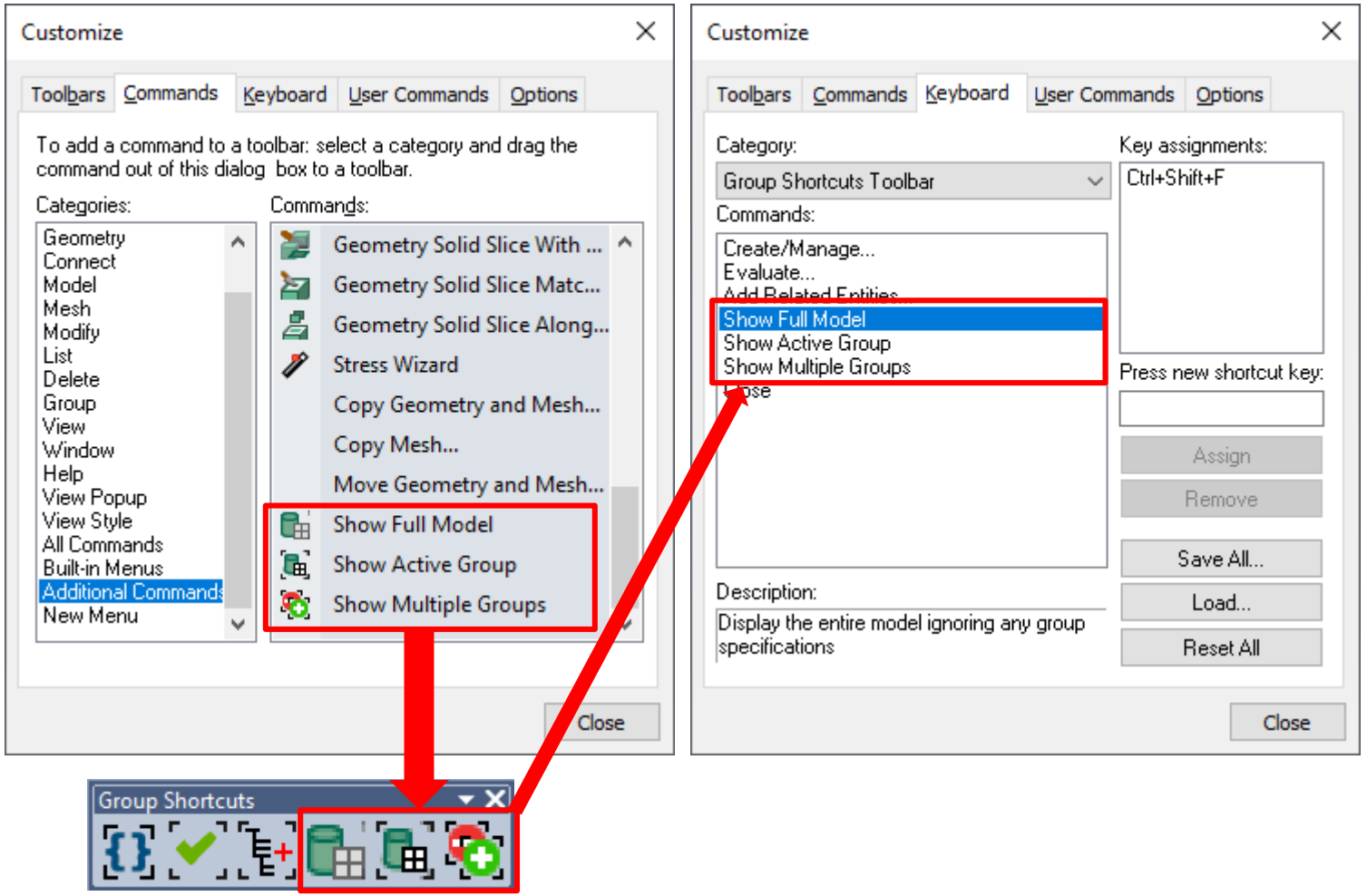
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
UI and Visualization – Miscellaneous

SIEMENS
Ingenuity for life

Added ability to use commands on "floating" toolbars (i.e., not "docked") while using another command. It was already possible to use commands on "docked" toolbars in previous versions.

Added "Group Display Mode" (i.e., *Show Full Model*, *Show Active Group*, and *Show Multiple Groups*) commands under "Additional Commands" on the *Commands* tab of the *Customize* dialog box. Once added to any toolbar, they can also have shortcut keys assigned



Unrestricted © Siemens 2020

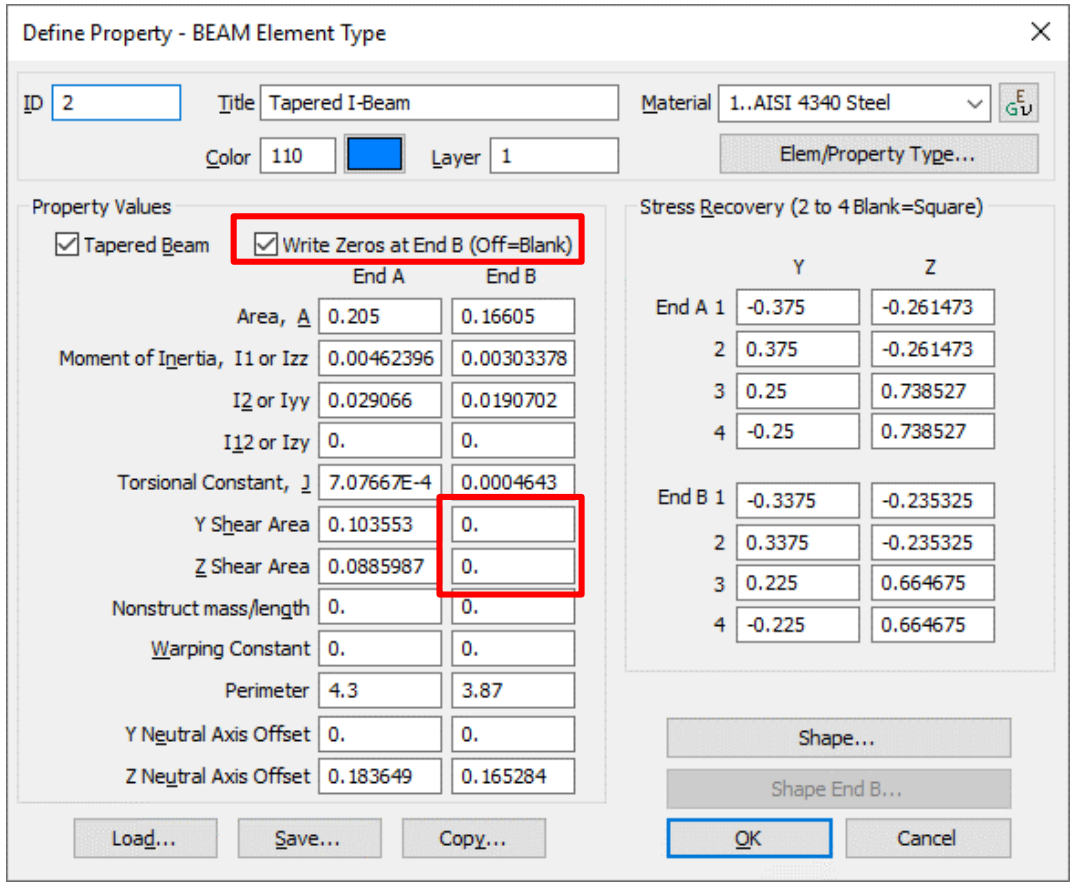
Agenda:

Performance Improvements
UI and Visualization
Preprocessing
Meshing
Post Processing
Solver Support
Miscellaneous

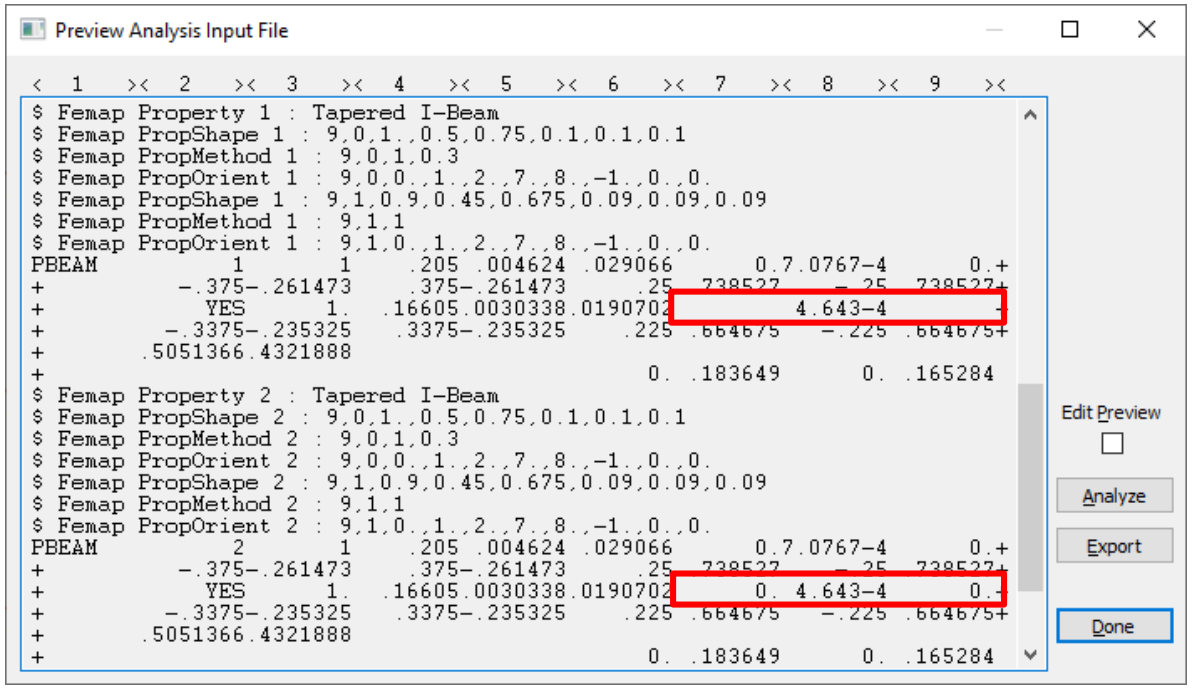
Simcenter Femap v2020.2 – What's New
Preprocessing – Beam Properties

SIEMENS
Ingenuity for life

Added *Write Zeros at End B (Off=Blank)* option for Nastran solvers to Beam Property



If option is disabled, nothing is written to Nastran input file for that field, which means End B = End A for field



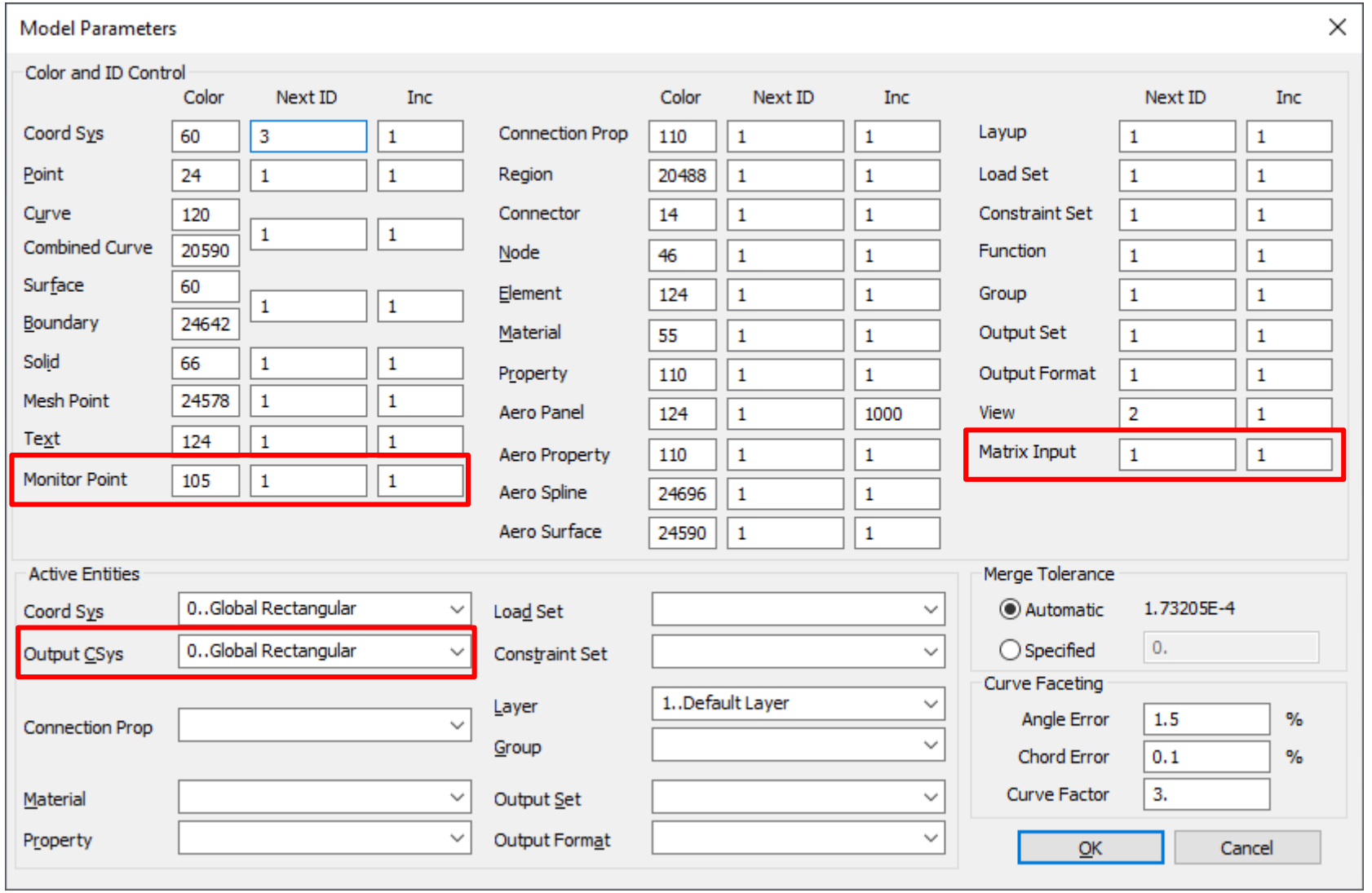
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Preprocessing – Tools

SIEMENS
Ingenuity for life

Tools->Parameters

- Added ability to specify Output Coordinate System to use for all newly created nodes
- Added ability to specify Color, Next ID, and Inc for Monitor Points
- Add ability to specify Next ID and Inc for Matrix Input entities



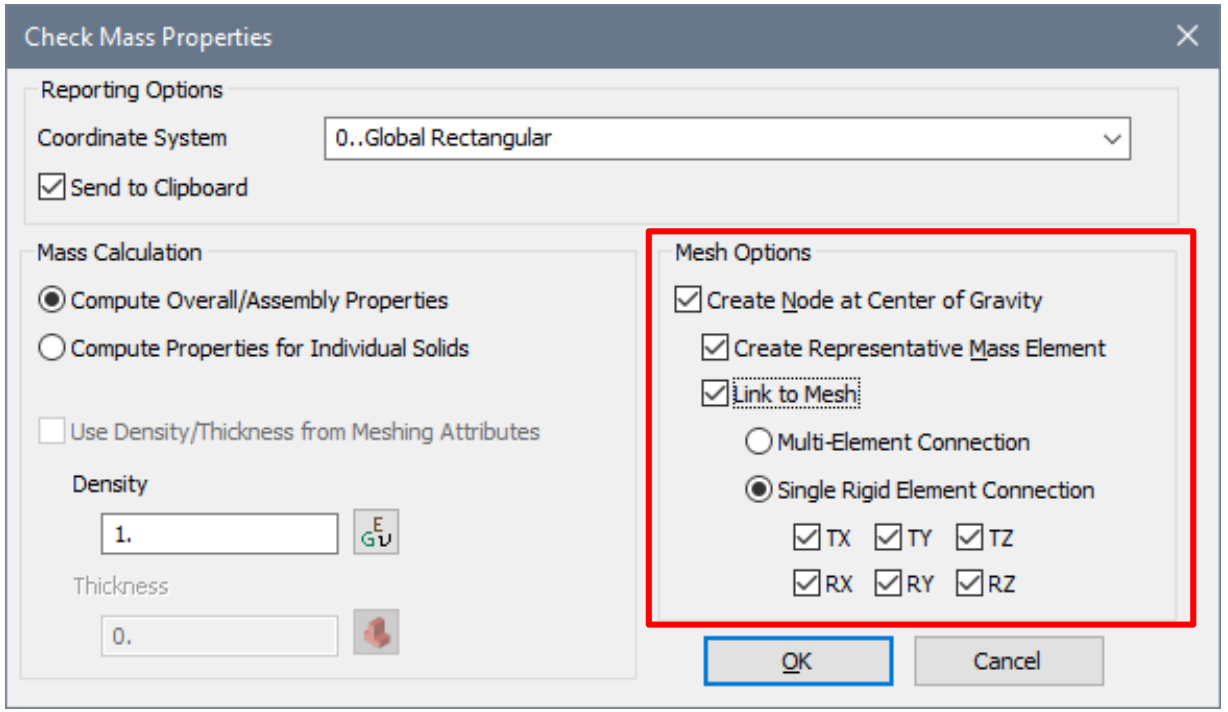
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Preprocessing – Tools

SIEMENS
Ingenuity for life

Tools->Mass Properties->Solid Properties

- Added support for multiple solids
- Support copying the listing to the Clipboard in Text, RTF, and HTML format
- Update the listing format to be similar to Tools->Mass Properties->Mesh Properties
- Supported computing overall properties and properties for individual solids. "Individual Solids" is only available if you select multiple "true solids" … no general or sheet bodies.



Added Mesh Options section to connect newly created representative mass element to any number of nodes in an existing mesh using either a single rigid element or multiple elements generated by Mesh->Connect->Closest Link functionality

Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Preprocessing – Tools

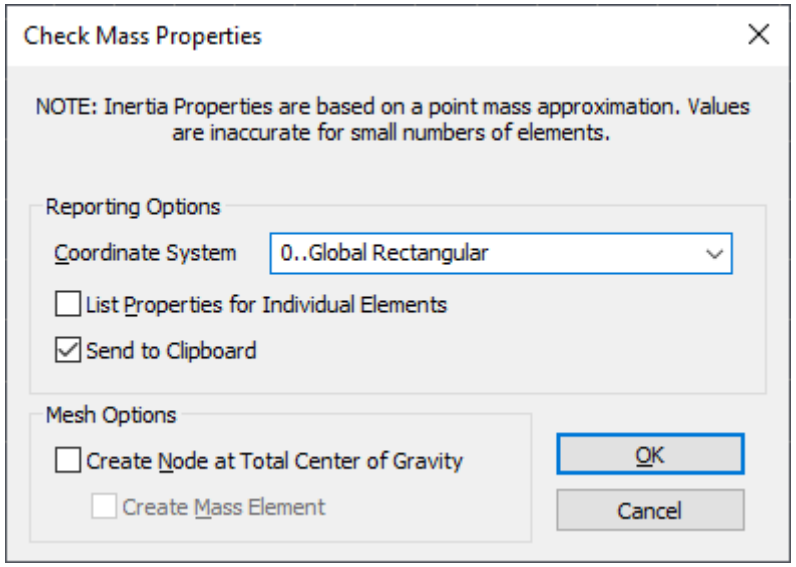
SIEMENS
Ingenuity for life

Tools->Mass Properties->Mesh Properties

- Added support to copy the listing to the Clipboard in Text, RTF, and HTML format

- Added support for Solid Laminates Elements
  - Laminate Layup thicknesses are scaled to match the length of each edge in the layup direction. Each ply is then computed as a "thin" single material brick/wedge with corners at the correct top/bottom ply locations.

- *NOTE: CG computations will not match Nastran unless you use PARAM,COUPMASS,1. This is an error in Nastran, not Simcenter Femap. See PR# 9631432. Also, inertias will not match, just like all of the Simcenter Femap inertia computations, we simply use a lumped mass at the centroid and do not account for the inertia of the individual element geometry.*



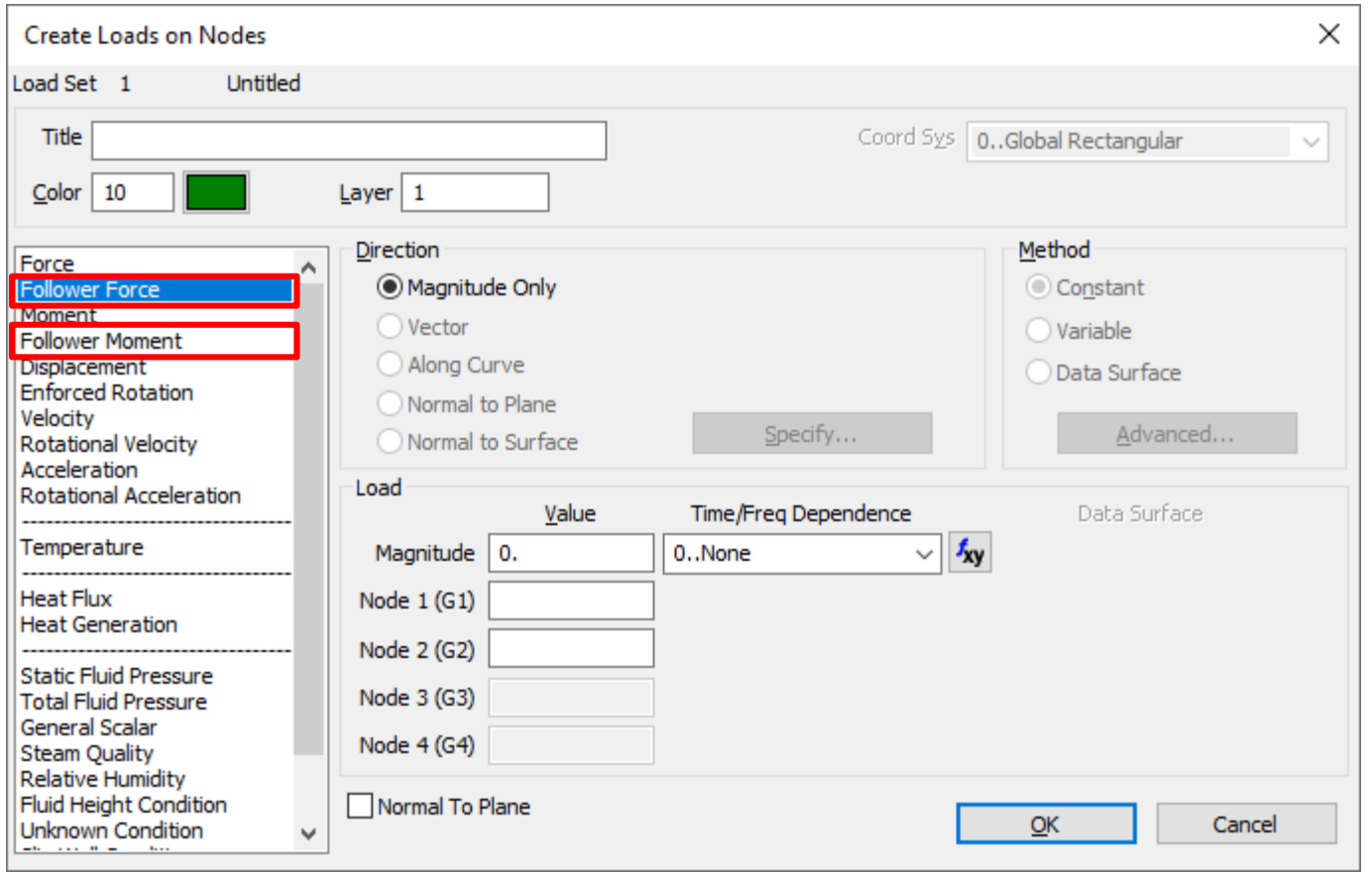
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Preprocessing – Loads and Boundary Conditions

SIEMENS
Ingenuity for life

Added ability to create Follower Forces and Follower Moments (Nastran Only)

- Define a force or moment in terms of a magnitude and direction nodes
- 2 nodes/points can be specified to define the direction of the of the load terms of a vector.
- 4 nodes/points can be specified to define the direction as normal to a plane
- Both nodal and geometric follower loads can be defined



Unrestricted © Siemens 2020

Agenda:

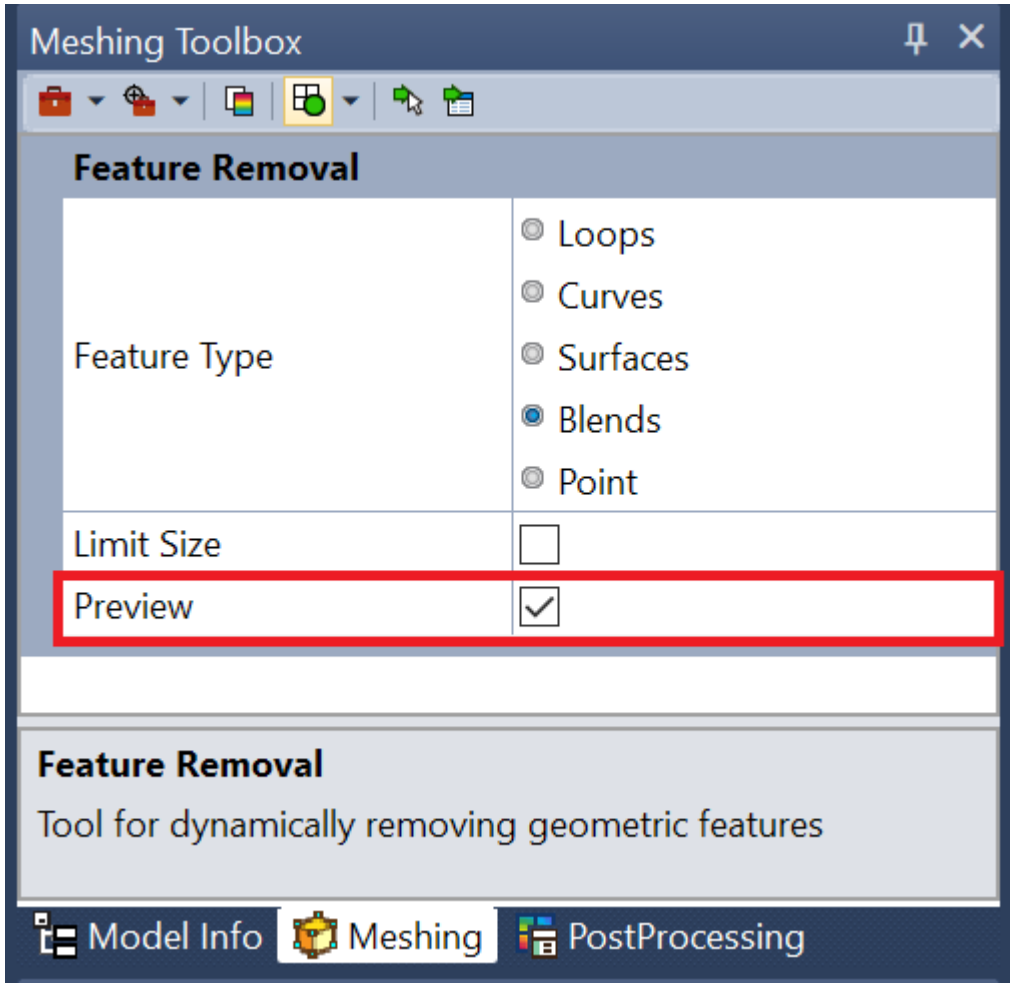
Performance Improvements
UI and Visualization
Preprocessing
Meshing
Post Processing
Solver Support
Miscellaneous

Simcenter Femap v2020.2 – What's New
Meshing Toolbox – Feature Removal Tool

SIEMENS
Ingenuity for life

Added Preview option to Feature Removal Blends.

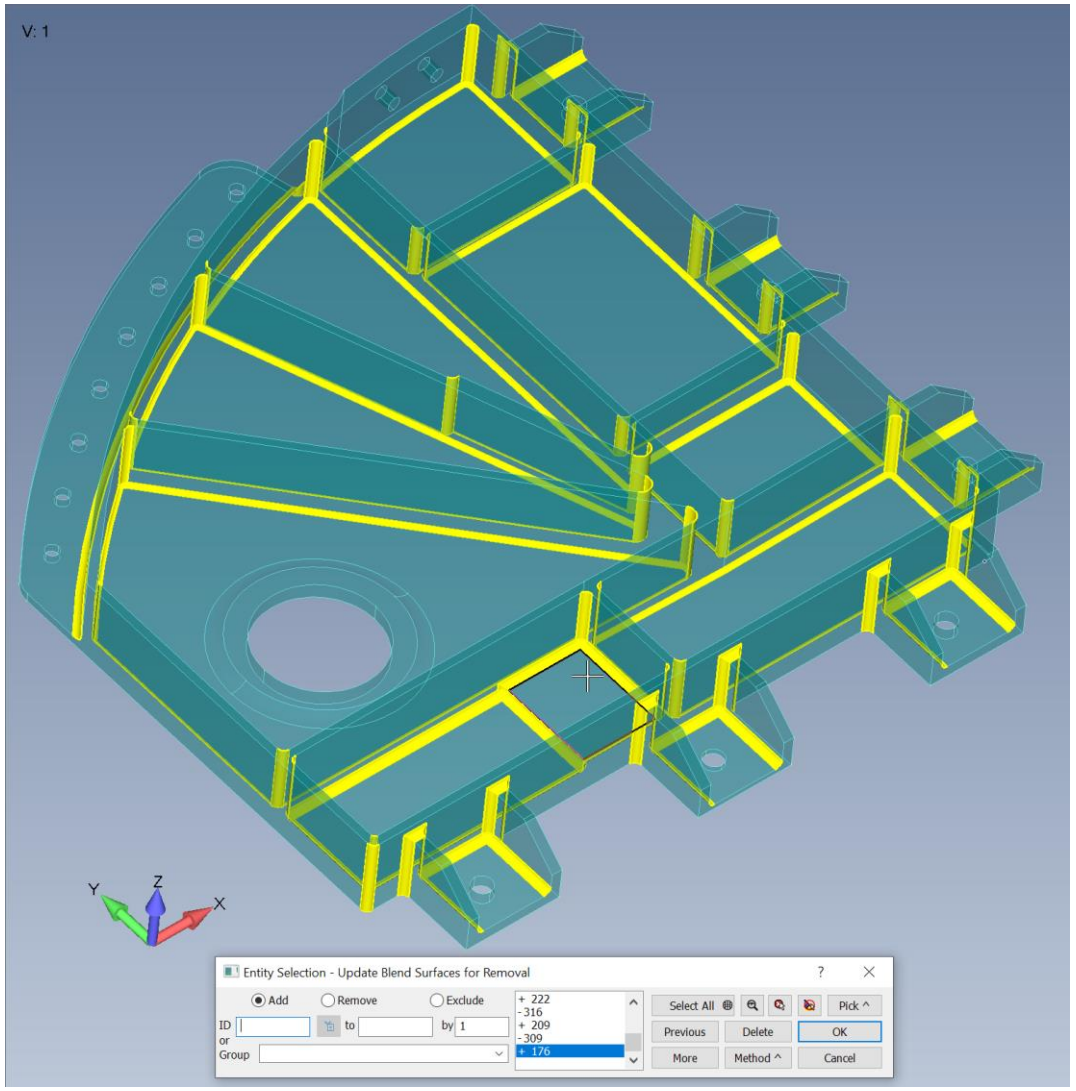
- Brings up surface entity select dialog with all found blends highlighted.
- Ability to add or remove specific blends.
- Can be used with or without Limit Size.

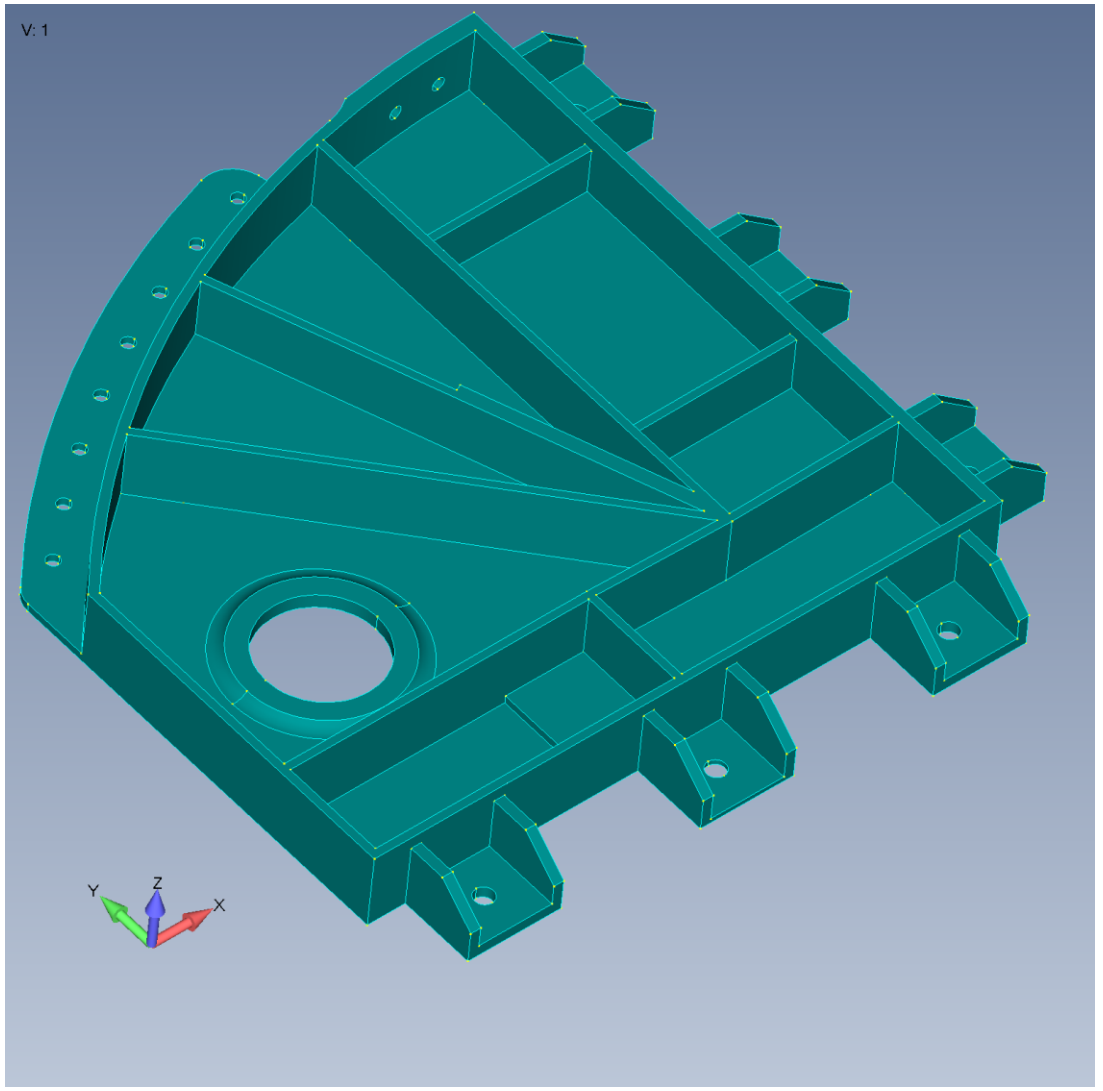


Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Meshing Toolbox – Feature Removal Tool

SIEMENS
Ingenuity for life





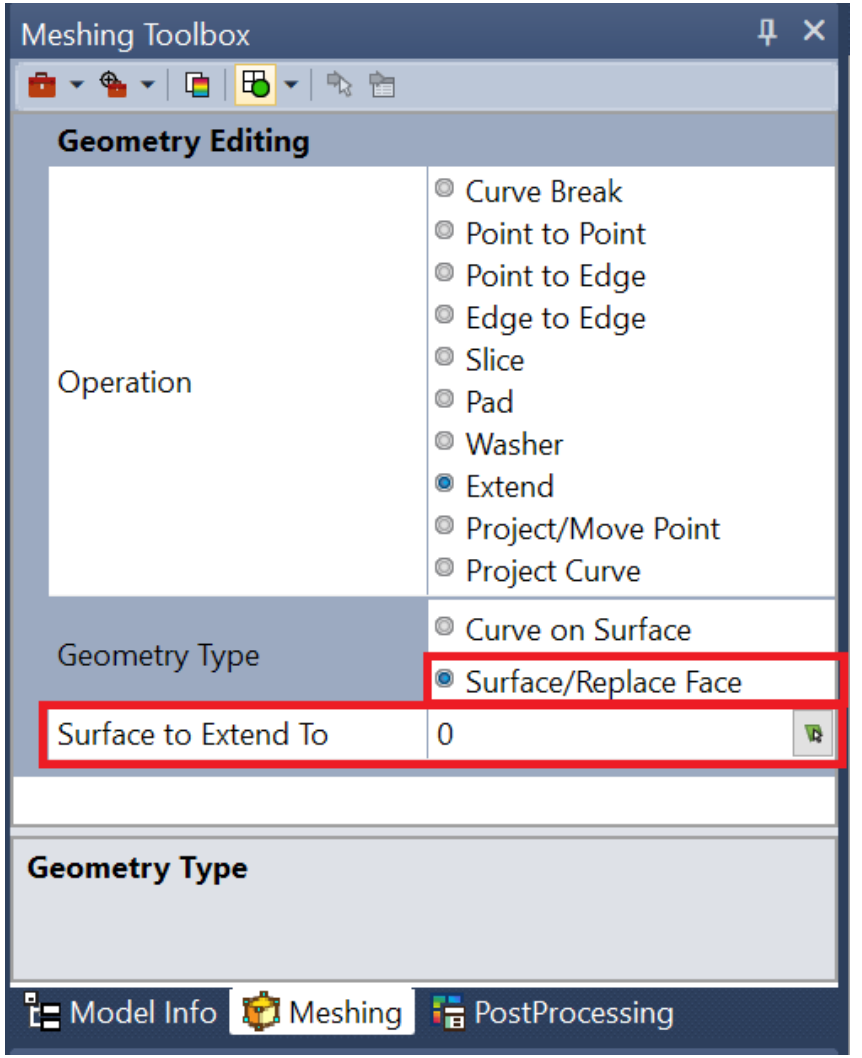
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Meshing Toolbox – *Geometry Editing* Tool

SIEMENS
Ingenuity for life

Added Surface/Replace Face capability to Extend under Geometry Editing.

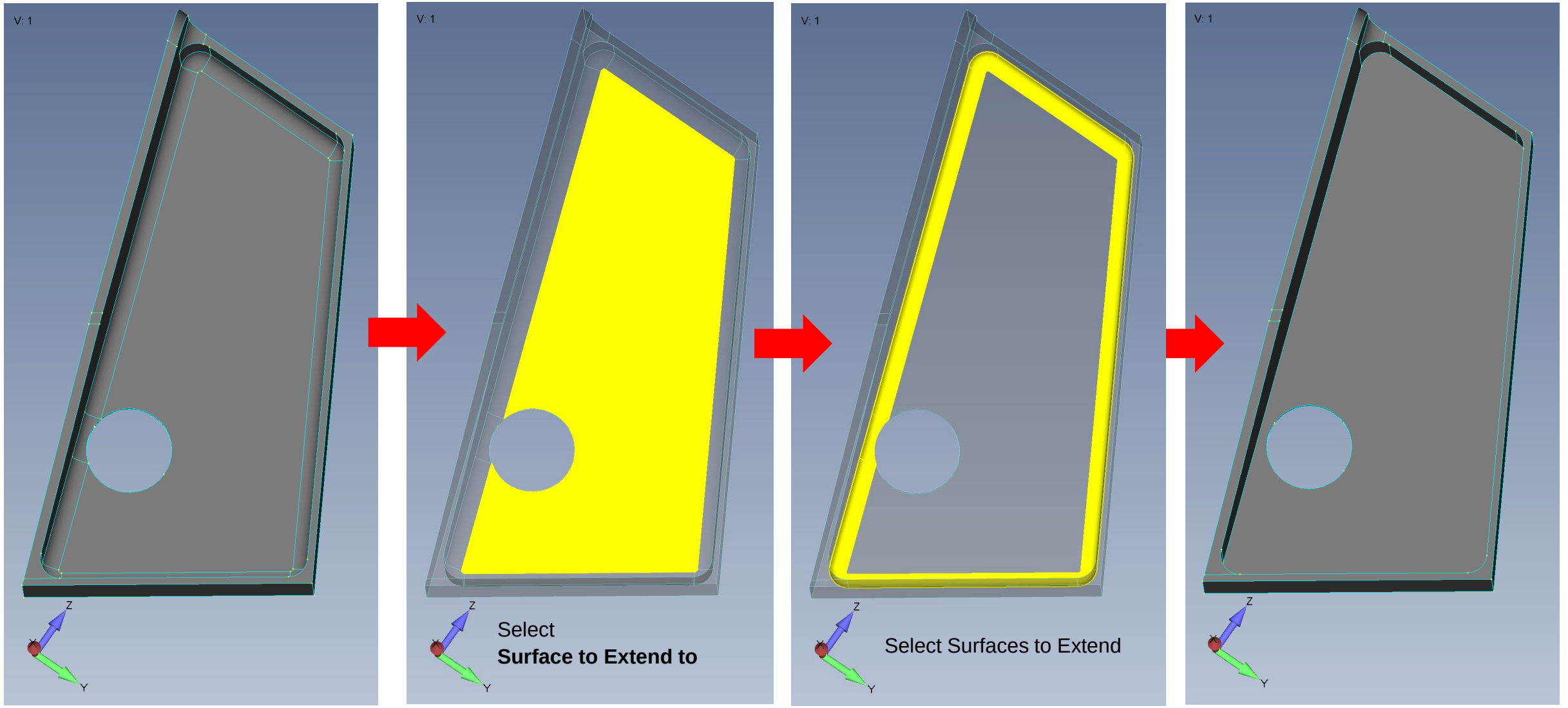
- Extend faces of solid up to selected surface.
- Remove fillets that have failed from blend removal.
- Raise or retract surfaces to main solid to remove features.
- Existing extend commands are now under Curve on Surface.



Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Geometry Editing Tool – *Surface/Replace Face* Workflow

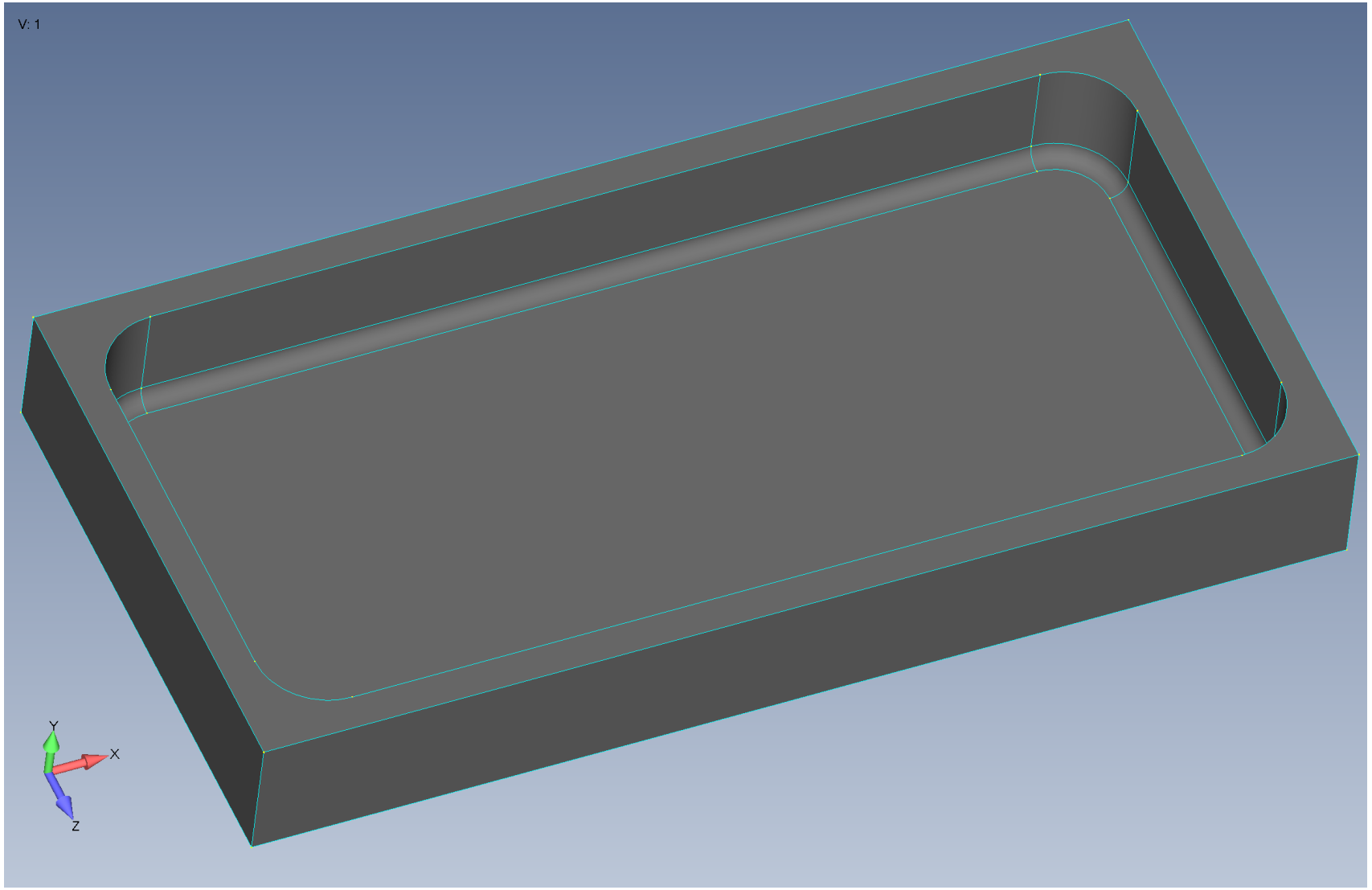
SIEMENS
Ingenuity for life



Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Geometry Editing Tool – *Surface/Replace Face* Workflow

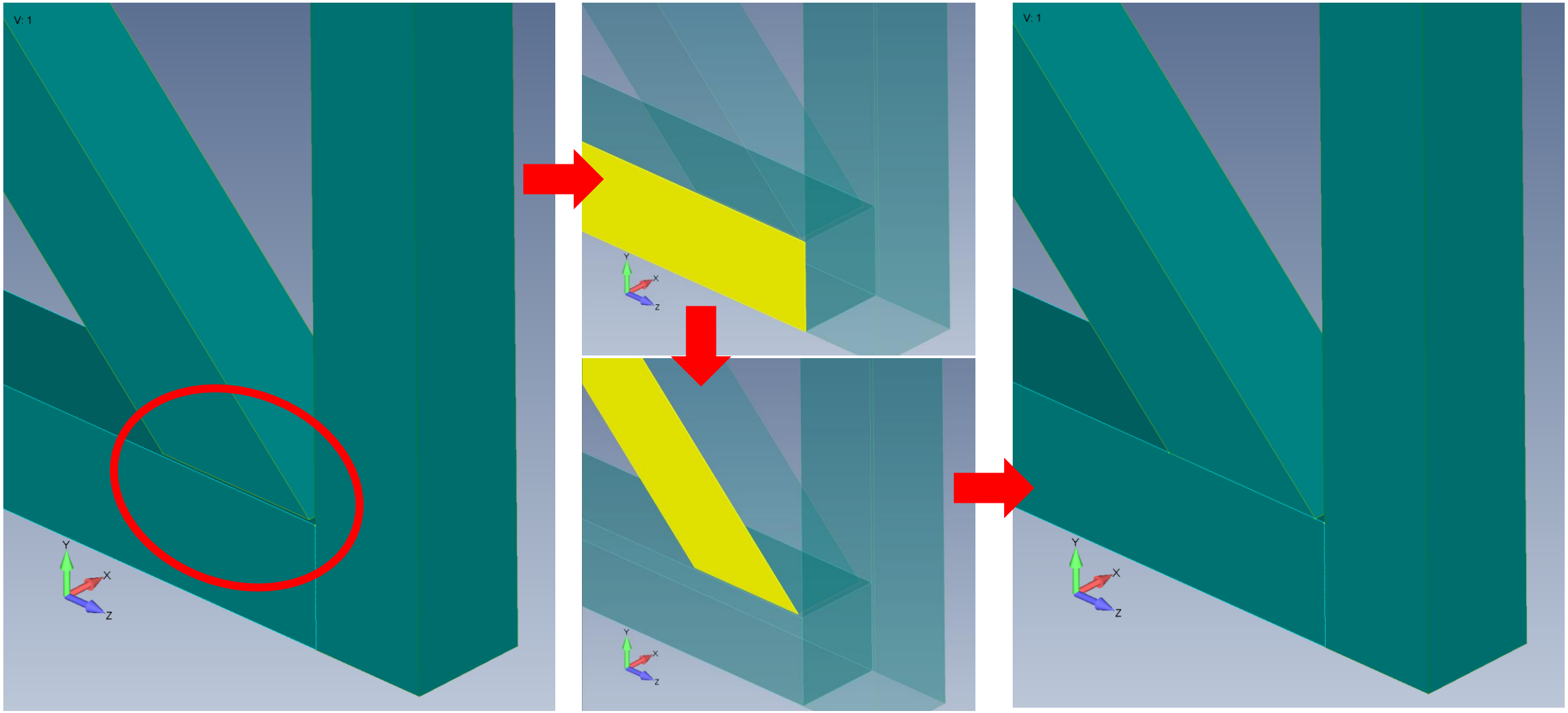
SIEMENS
Ingenuity for life



Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Geometry Editing Tool – *Surface/Replace Face* Workflow

SIEMENS
Ingenuity for life



Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Meshing – Mesh Editing

SIEMENS
Ingenuity for life

- Updated various Mesh Editing commands to more fully and consistently handle the other entities associated and/or related to the elements being edited

- Commands that have been updated include:
  - Mesh->Editing->Interactive
  - Mesh->Editing->Split
  - Mesh->Editing->Element Refine
  - Mesh->Editing->Edge Split

- Features that are supported across these commands include:
  - Updating Nodal Constraints and Nodal Permanent Constraints
  - Updating Loads (On Faces, Corner Pressures, On Edges, Distributed Line)
  - Updating Regions (both Nodal and Elemental)
  - Updating Tapered Beam Shapes, Beam Offsets, Plate Thickness and Material Direction
  - Updating Groups
  - Updating Geometric Associativity

Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Meshing – Miscellaneous

SIEMENS
Ingenuity for life

- Mesh Sizing
  - Improved consistency when setting Mesh Sizes on curves using Element Size
  - Previously two curves of seemingly similar length could end up with a different number of elements (+/- 1) due to very small length differences.

- Combined Curve Creation (typically done to improve mesh quality)
  - Only allow creation of Combined Curves if all underlying curves have the same manifold type (i.e., all curves are Free Edge, Manifold, NonManifold or Wirebody).

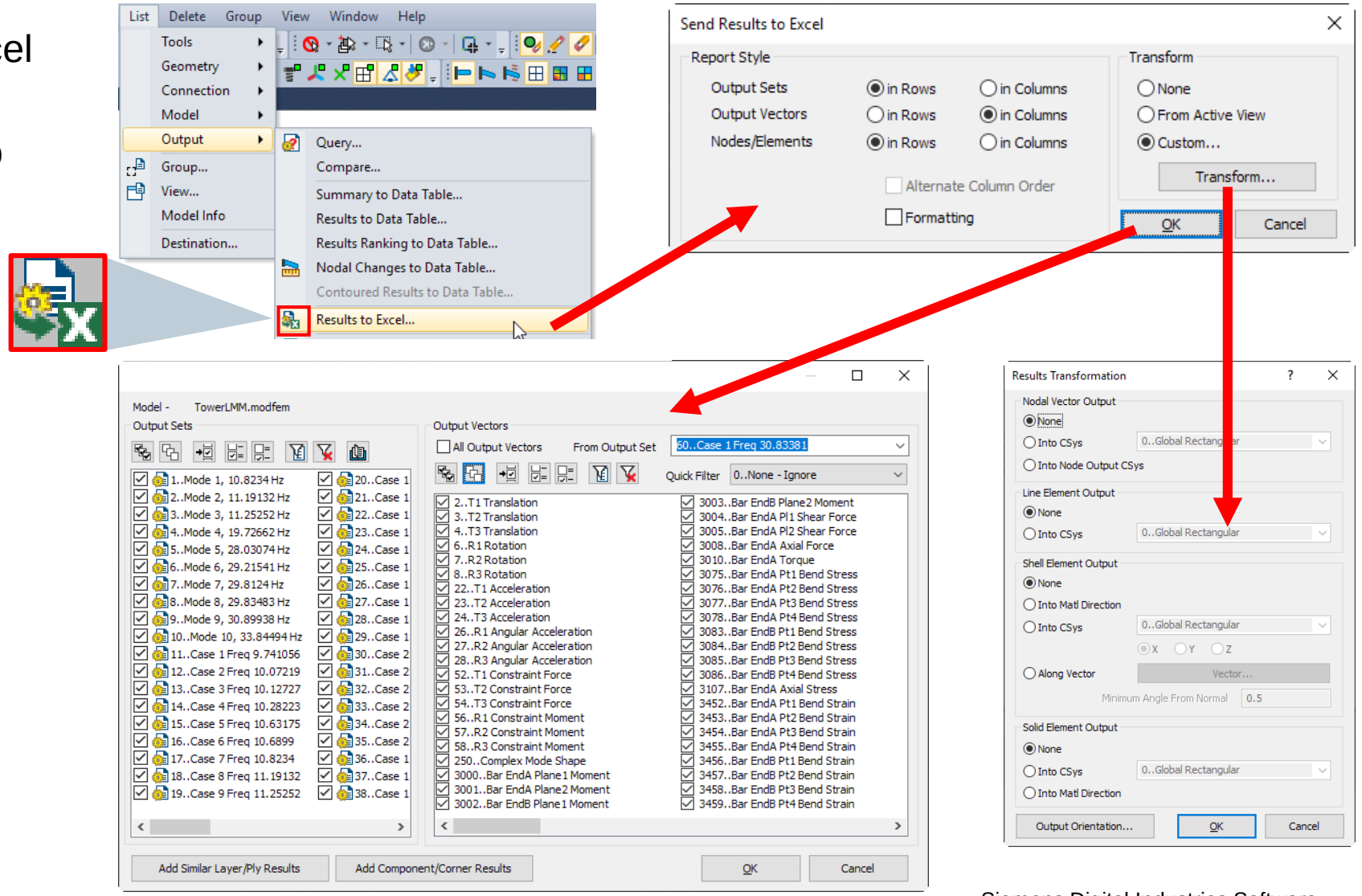
Unrestricted © Siemens 2020

Agenda:
Performance Improvements
UI and Visualization
Preprocessing
Meshing
Post Processing
Solver Support
Miscellaneous

Simcenter Femap v2020.2 – What's New
Postprocessing – Send to Excel

SIEMENS
Ingenuity for life

- List->Output->Results to Excel
- Automatically opens Excel to transfer a variety of Results very quickly
- Take advantage of:
  - Row / Column control
  - Alternate column order
  - Formatting style
  - Transformation of Output Data
- Transfer Nodal and/or Elemental Results at same time



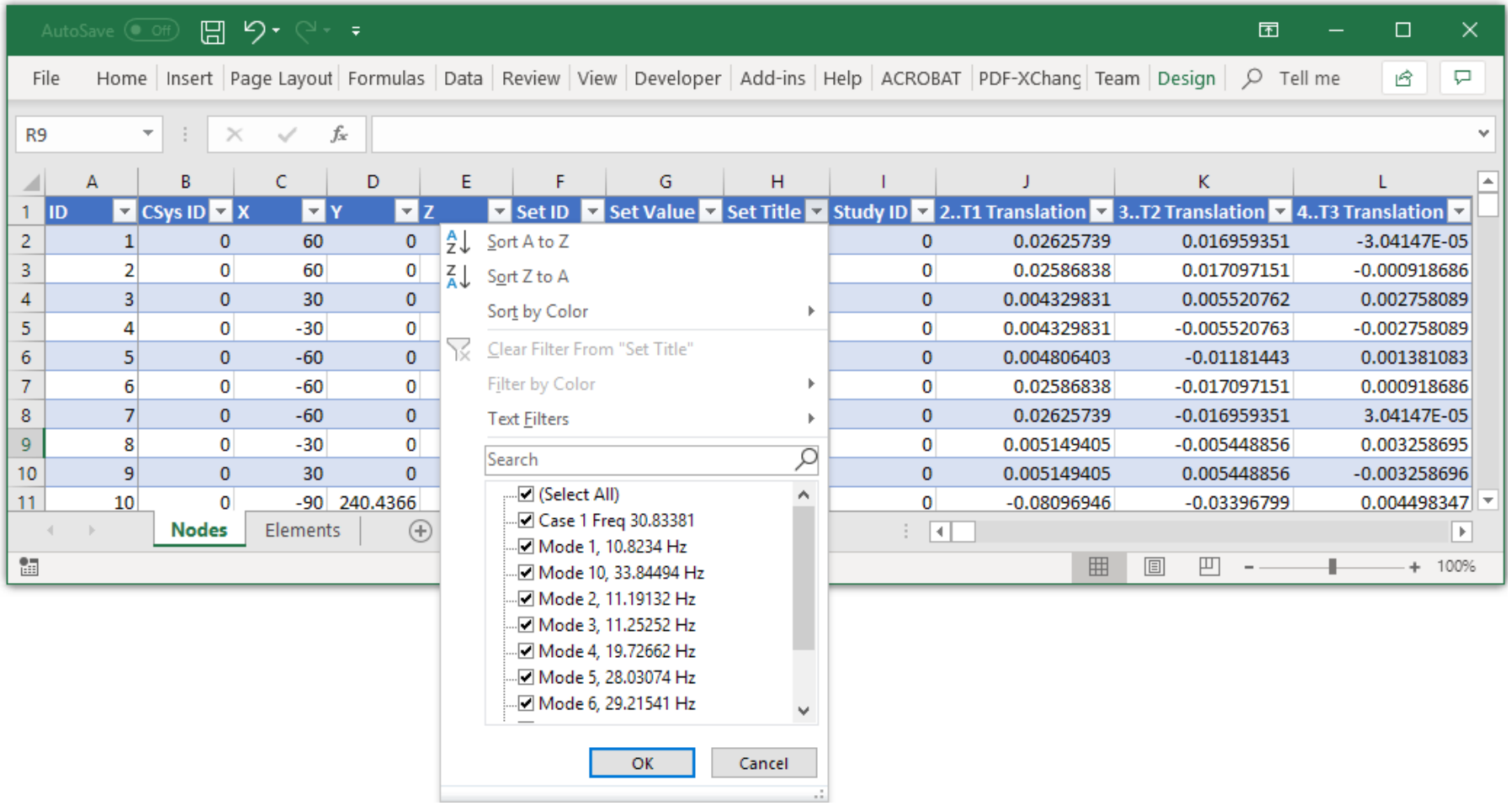
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Postprocessing – Send to Excel

SIEMENS
Ingenuity for life

When *Formatting* option is enabled, each worksheet in Excel will include:

- Column Filters
- Frozen Row Heading
- Frozen ID Column
- Nodal and Elemental results organized by different sheets

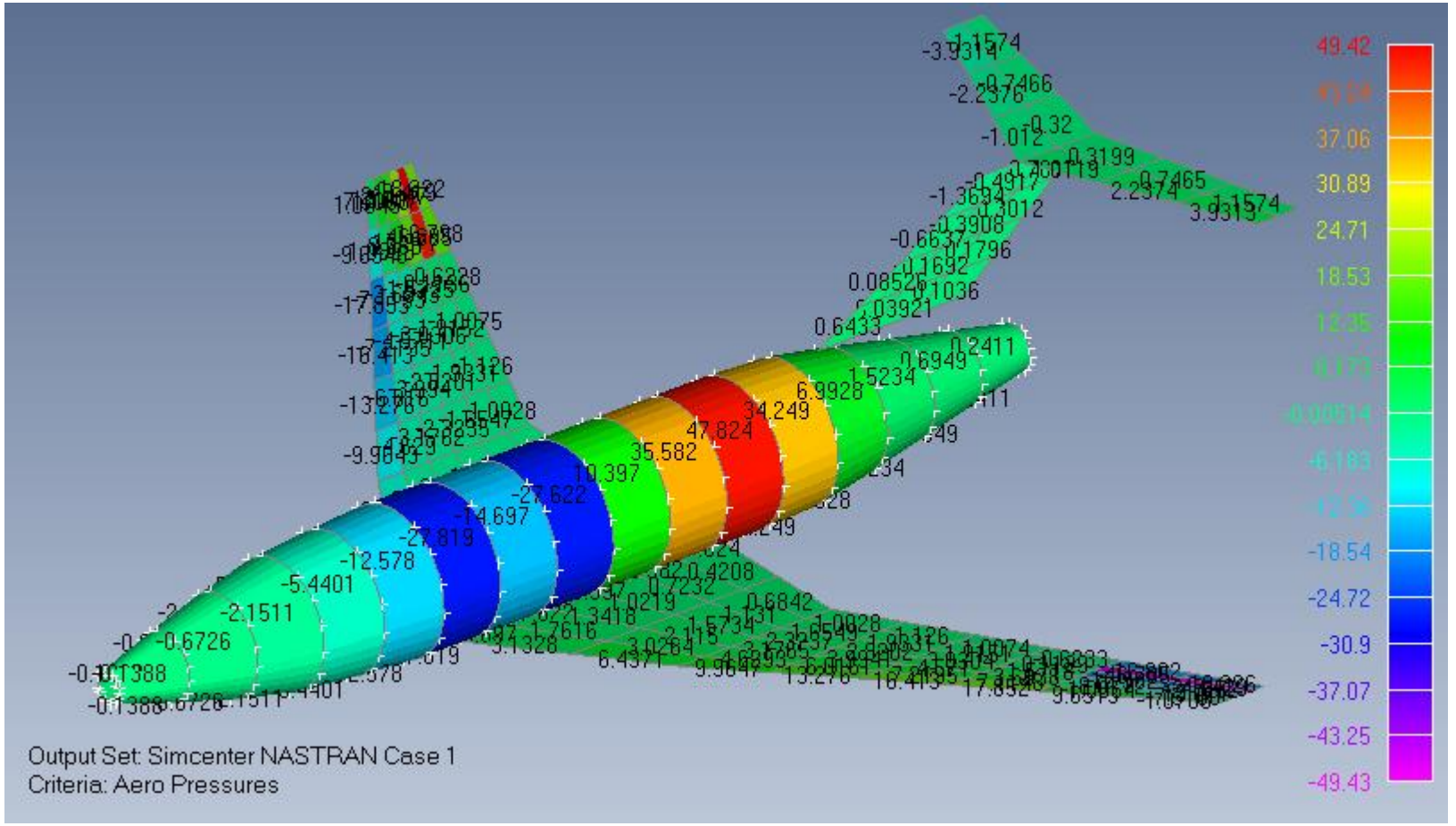


Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Postprocessing

SIEMENS
Ingenuity for life

Added support to display *Aero Pressures* from Static Aeroelasity (SOL 144) analysis (*.f06 file only)

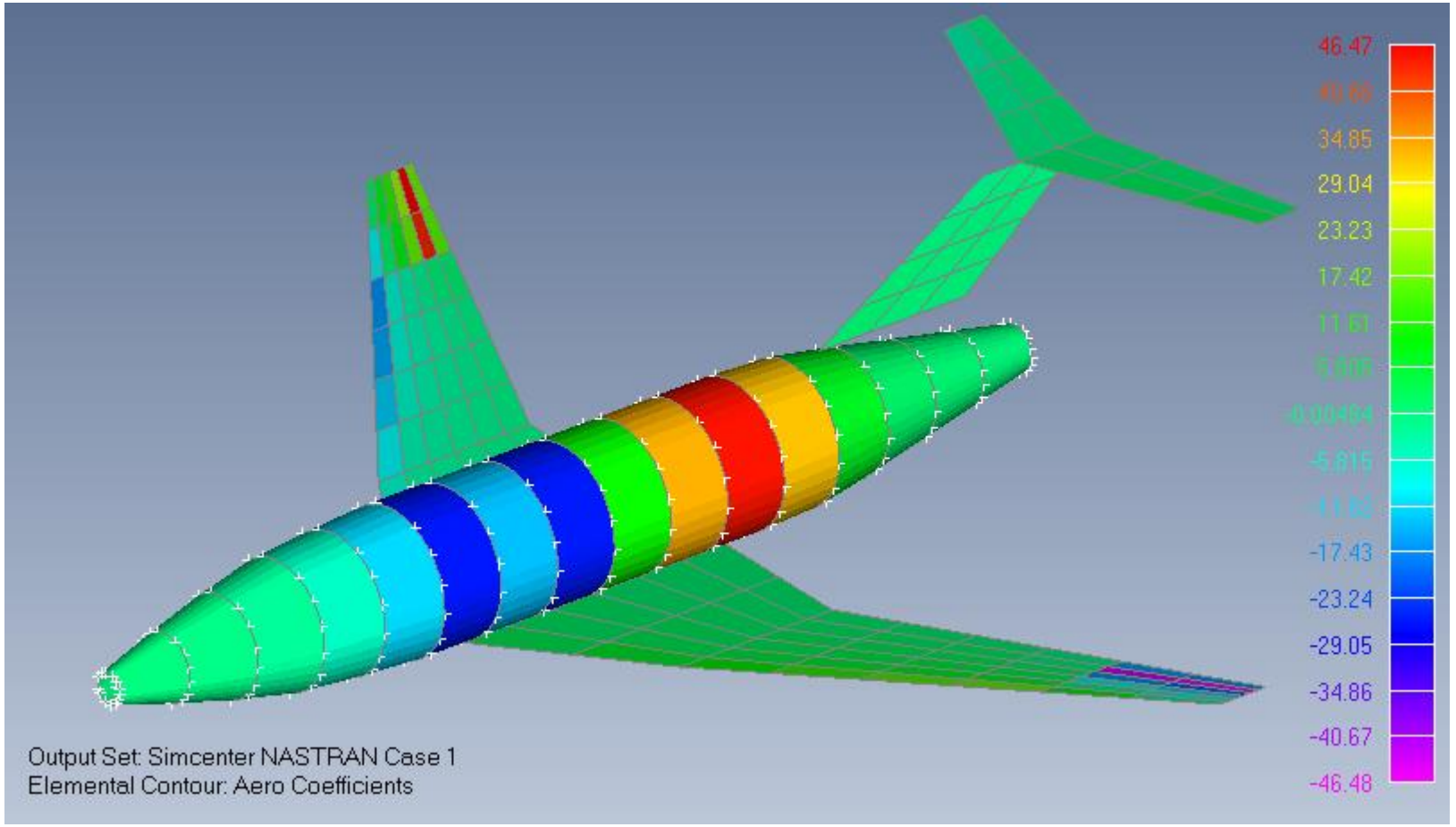


Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Postprocessing

SIEMENS
Ingenuity for life

Added support to display *Aero Coefficients* from Static Aeroelasity (SOL 144) analysis (*.f06 file only)

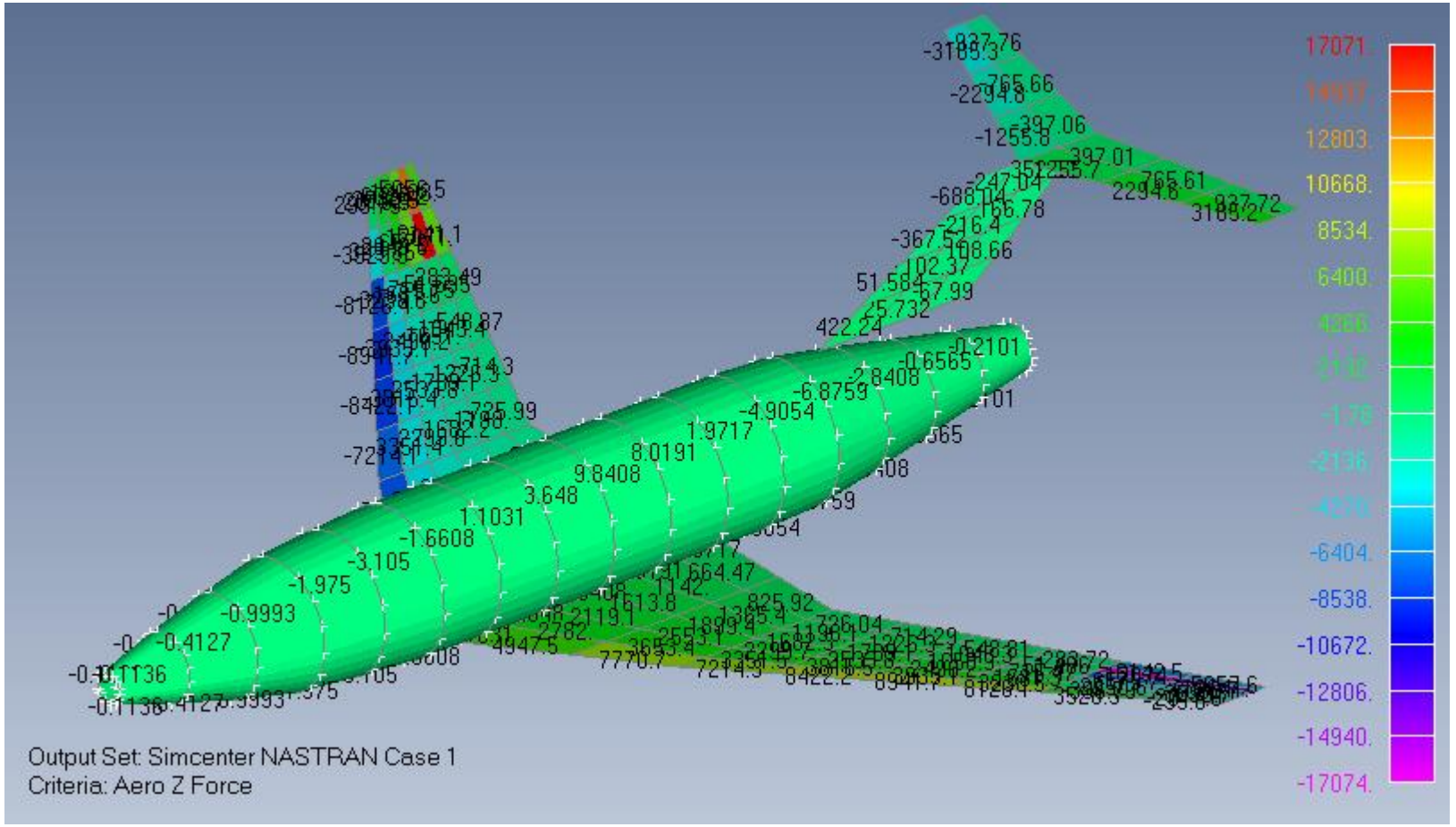


Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Postprocessing

SIEMENS
Ingenuity for life

Added support to display *Aero Forces* generated by Static Aeroelasity (SOL 144) analysis (*.f06 file only)



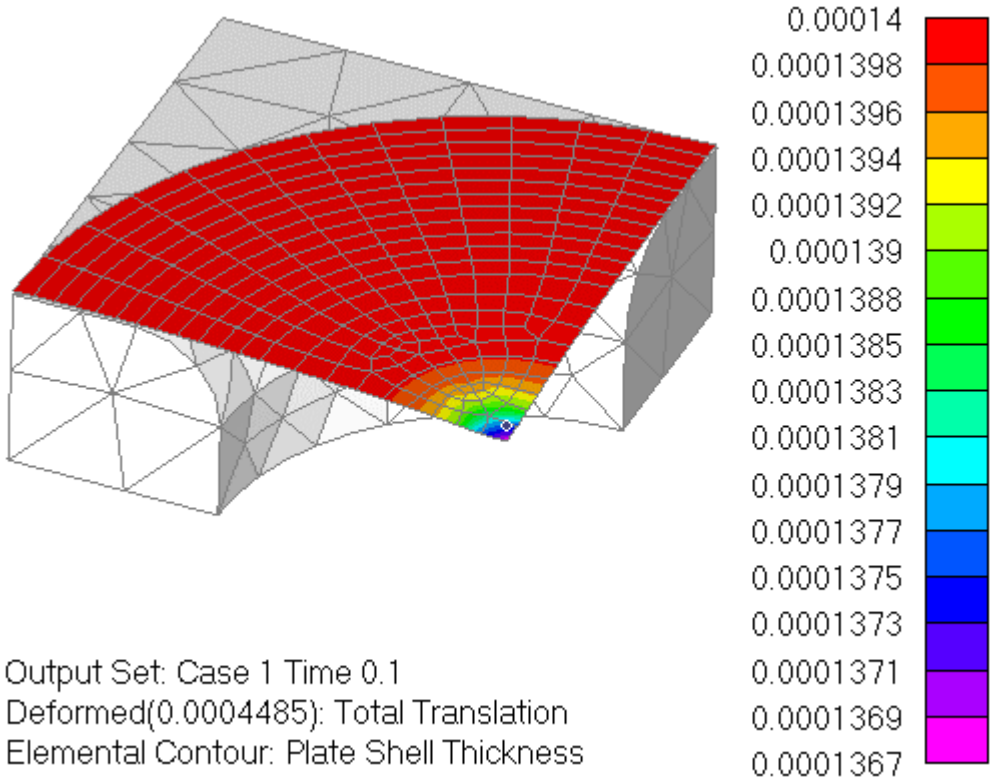
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Postprocessing

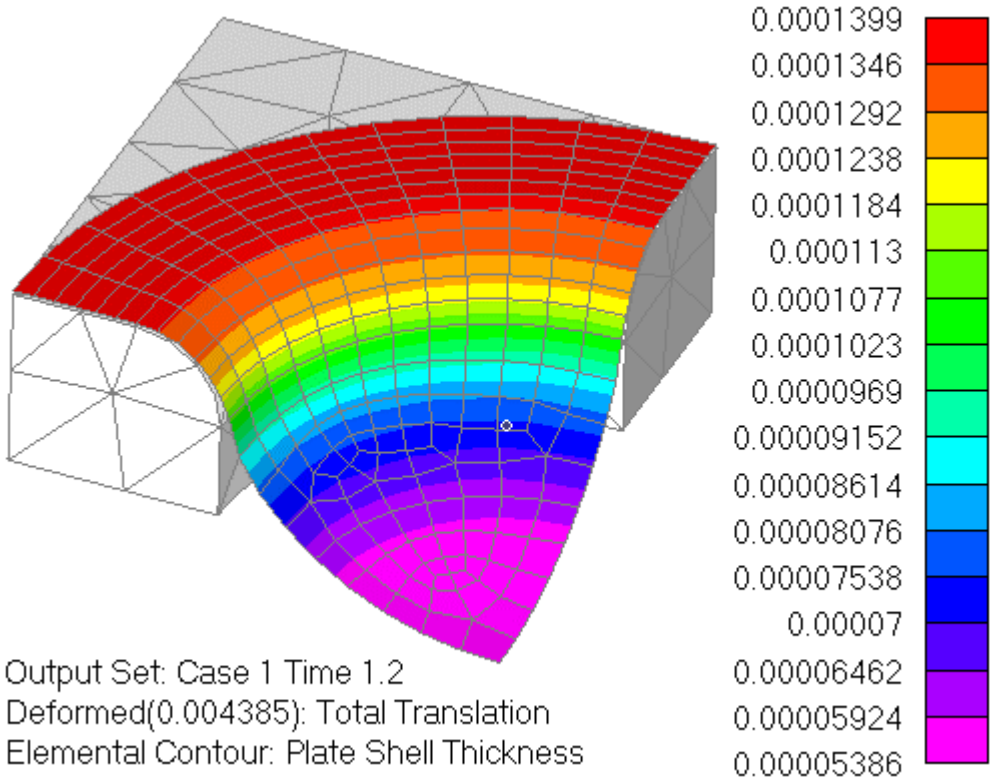
SIEMENS
Ingenuity for life

Added support for Shell Thickness Output (requested by SHELLTHK) from Simcenter Nastran SOL 402

Step 1 Thickness: Max = 1.4E-04; Min 1.367E-04



Step 12 Thickness: Max = 1.399E-04; Min 5.386E-05



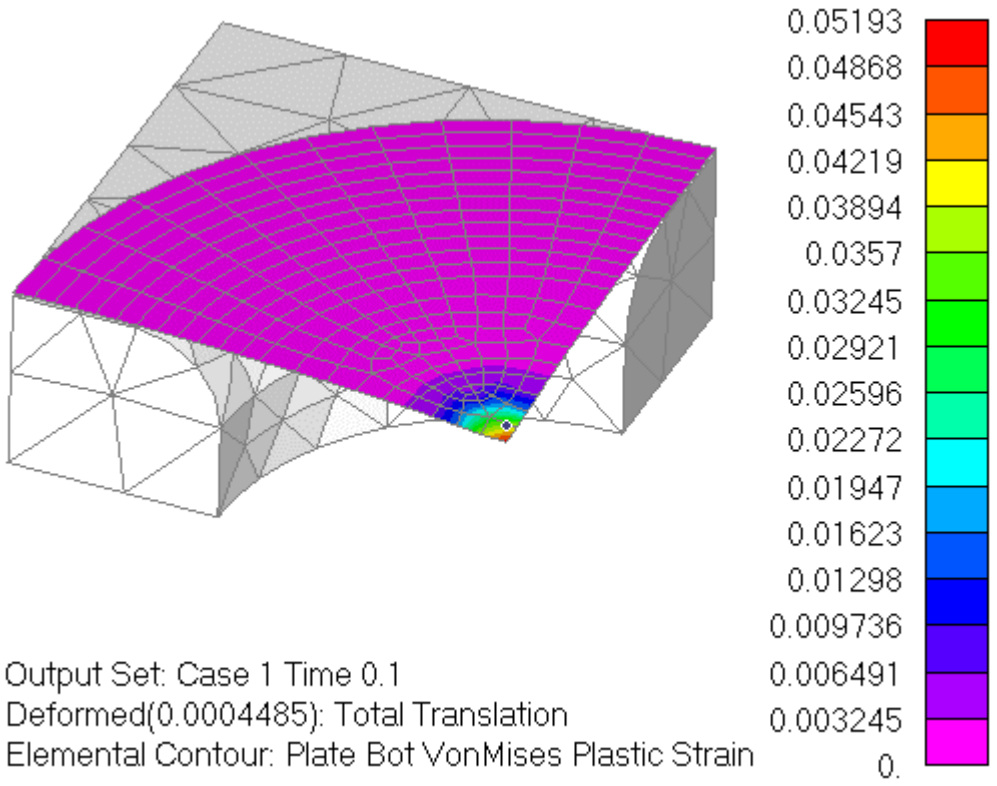
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Postprocessing

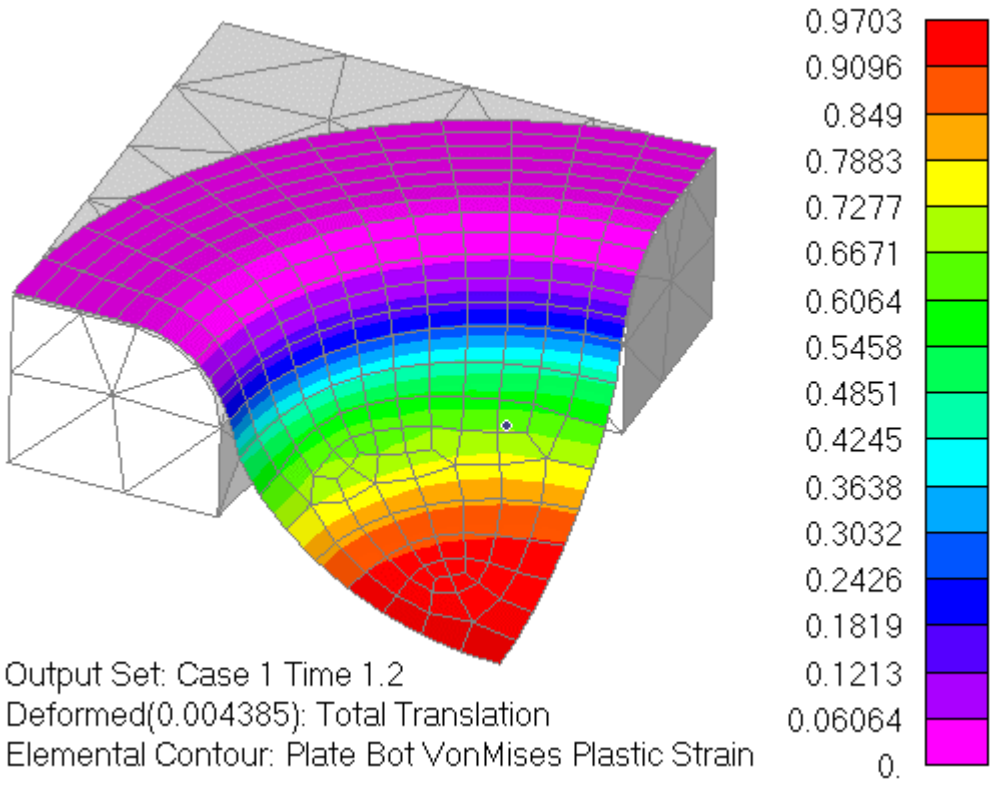
SIEMENS
Ingenuity for life

Added support for Plastic Strain Output (requested by PLSTRN) from Simcenter Nastran SOL 401/402

Step 1 Plastic Strain: Max = 0.05193; Min 0.0



Step 12 Plastic Strain: Max = 0.9703; Min 0.0

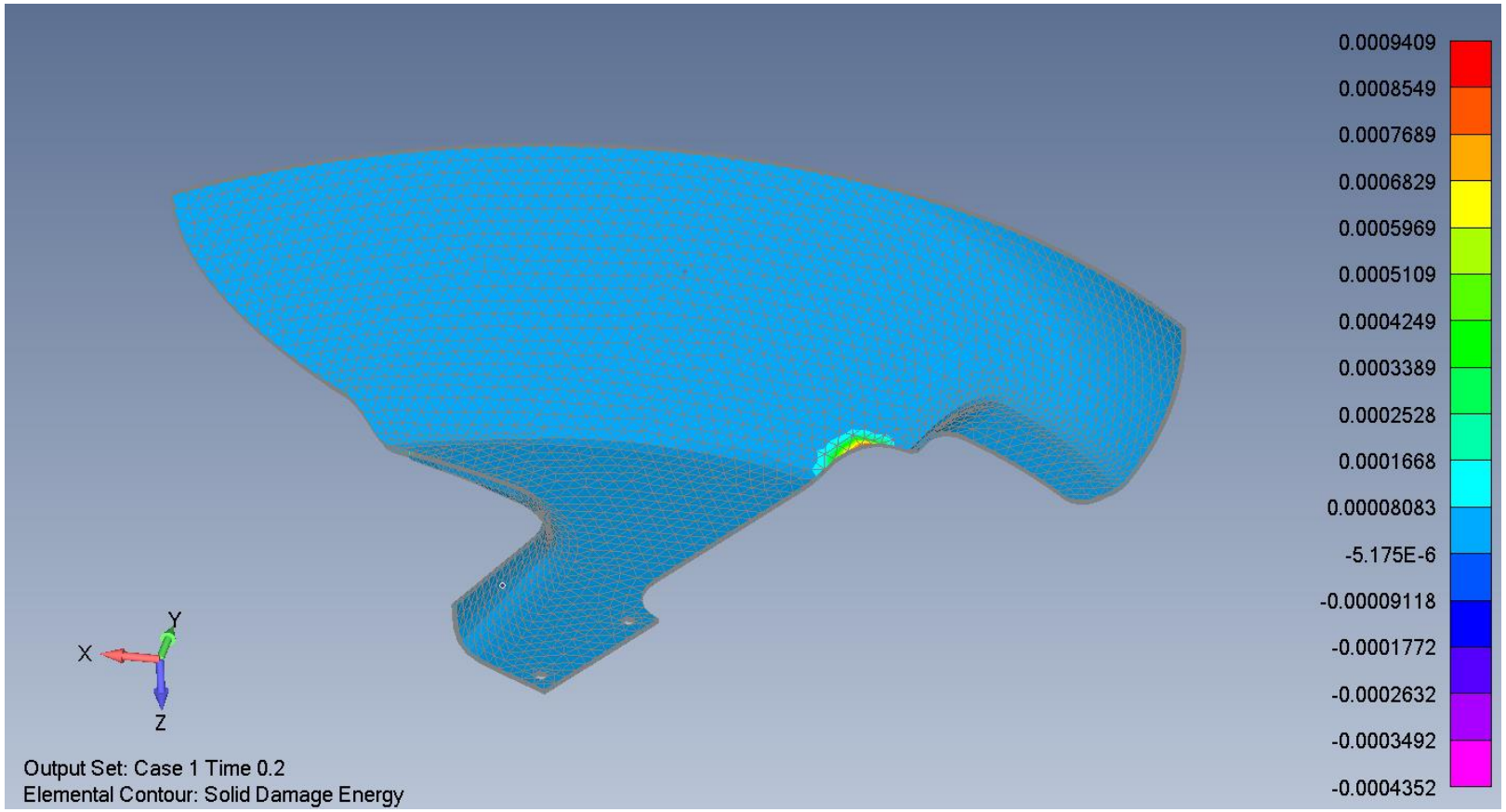


Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Postprocessing

SIEMENS
Ingenuity for life

Added support for progressive failure results output (requested by PFRESULTS) from SOL401/SOL402



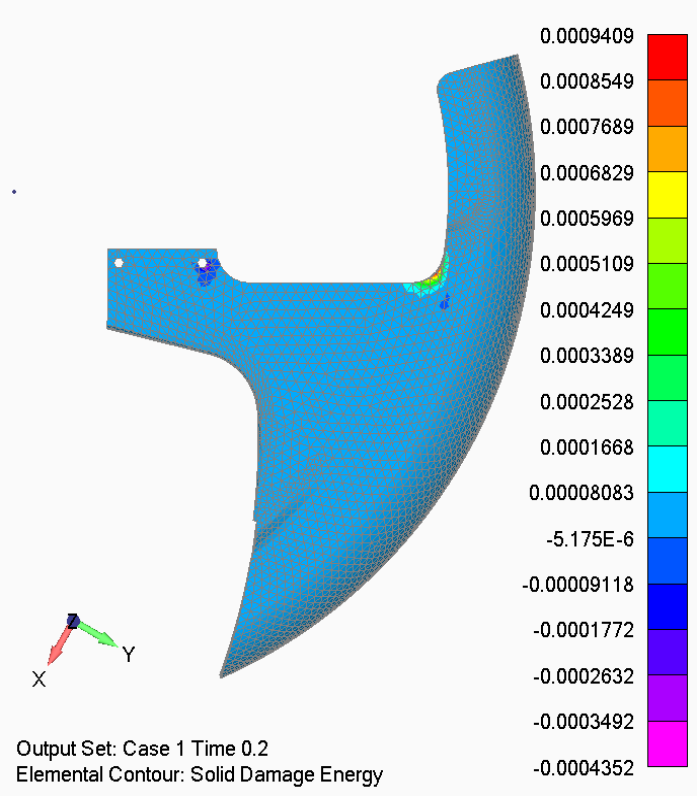
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Postprocessing

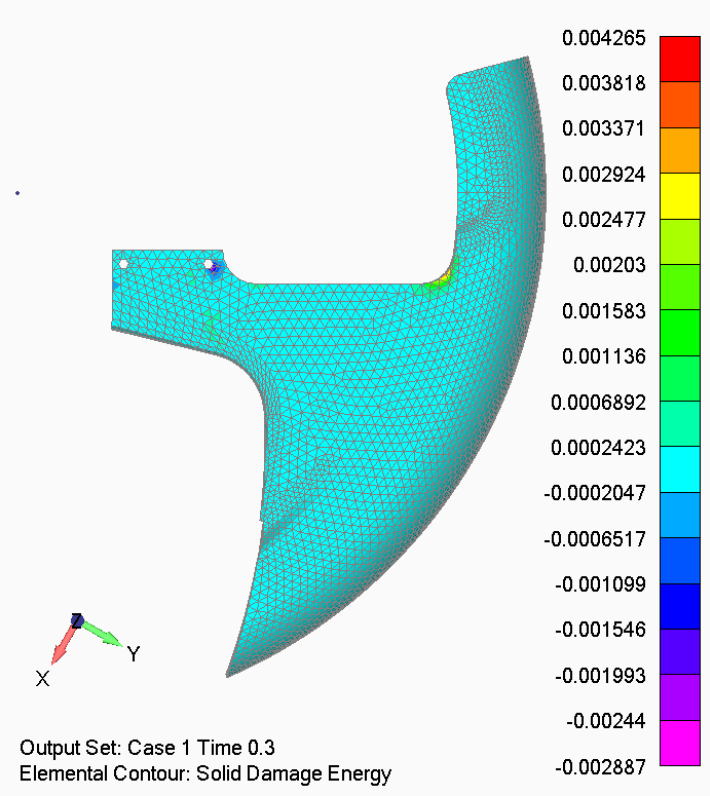
SIEMENS
Ingenuity for life

Failure results include Damage Status, Damage Values, **Damage Energy**, and Crack Density

Time 0.2 Damage Energy: Max = 9.41E-4; Min -0.435E-4



Time 0.3 Damage Energy: Max = 4.27E-3; Min -2.89E-3



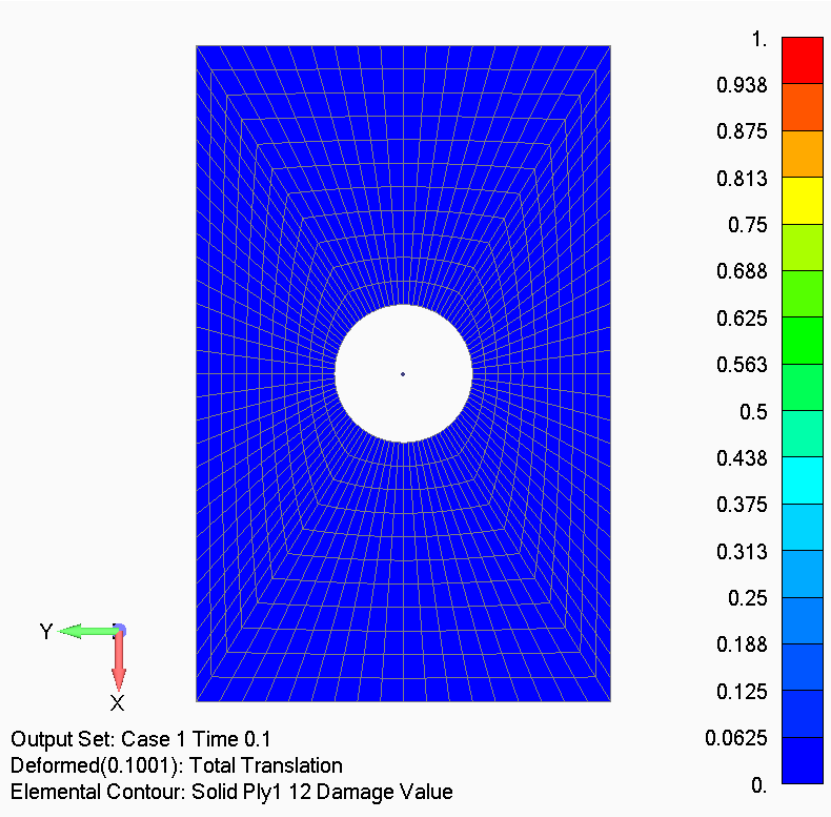
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Postprocessing

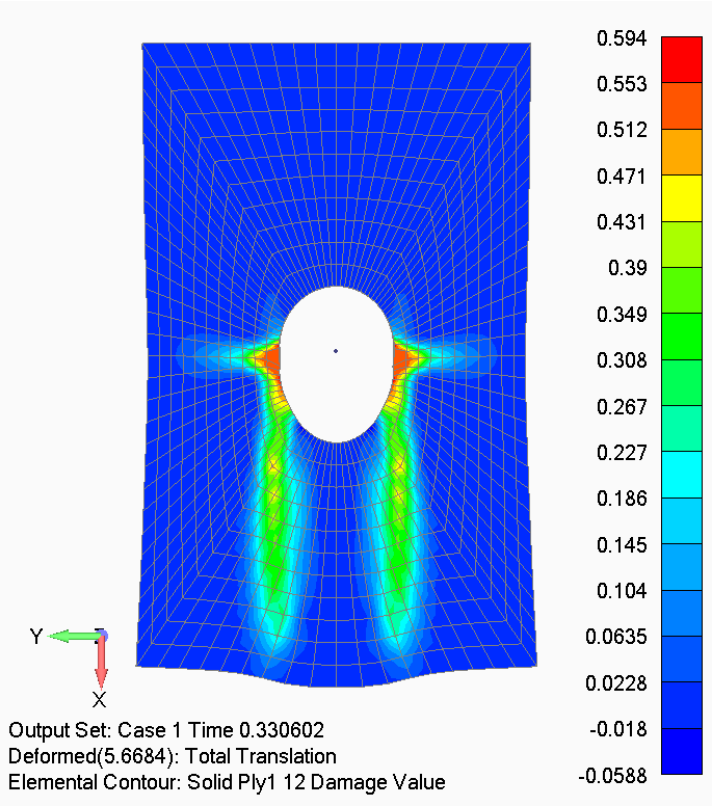
SIEMENS
Ingenuity for life

Failure results include Damage Status, **Damage Values**, Damage Energy, and Crack Density

Step 1 Ply D12: Max = 0.0; Min 0.0



Time 0.33 Ply D12: Max = 5.94E-1; Min -5.88E-2



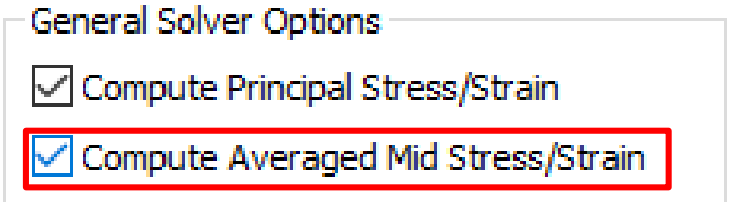
Unrestricted © Siemens 2020

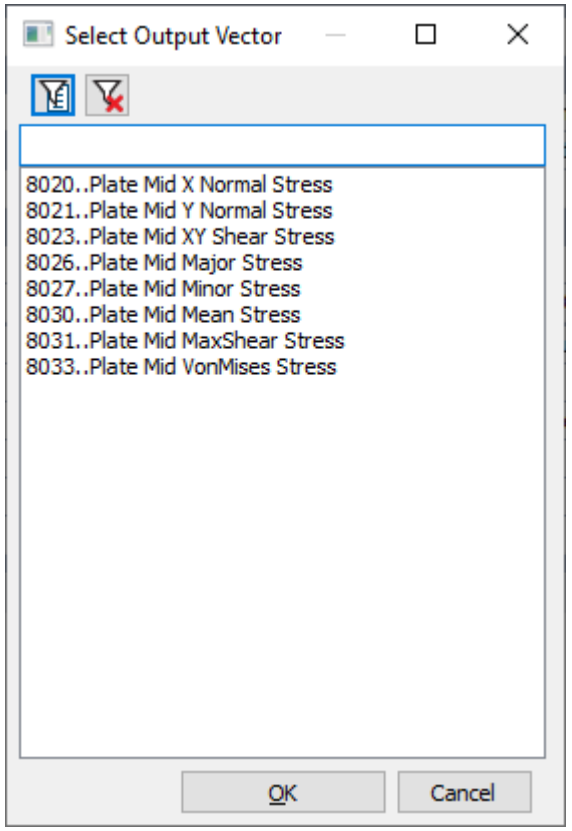
Simcenter Femap v2020.2 – What's New
Postprocessing

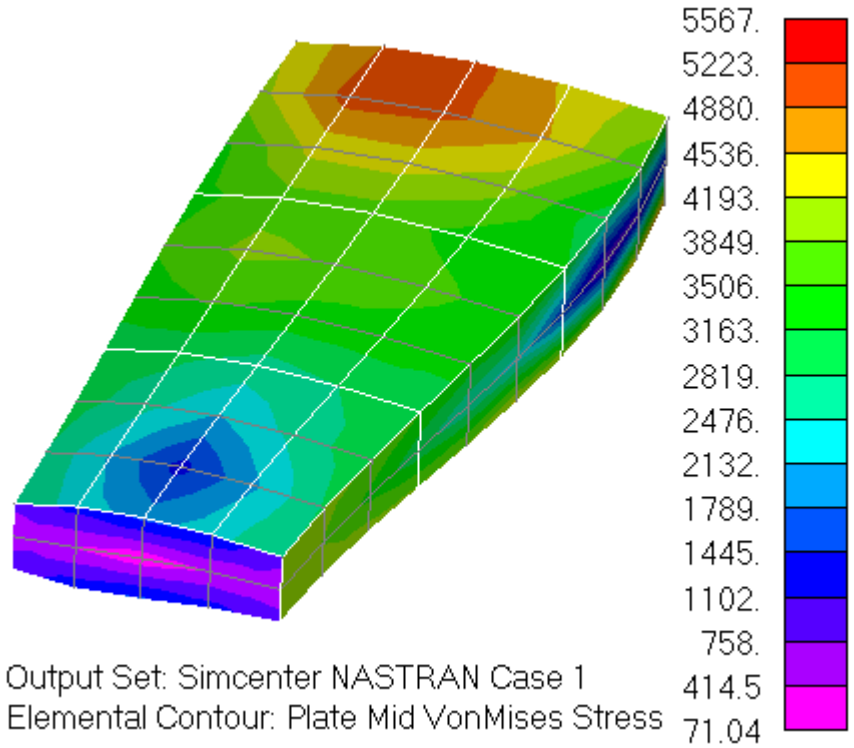
SIEMENS
Ingenuity for life

Added an option to *Results* tab of File-> Preferences to allow computing Averaged Midplane Stress and Strain.

- Simple average of Top and Bottom Results.
- Includes computation of Invariants from averaged mid values.
- Supported for Results either Read into the Database or Attached.
- Not supported for Complex Results.







Unrestricted © Siemens 2020

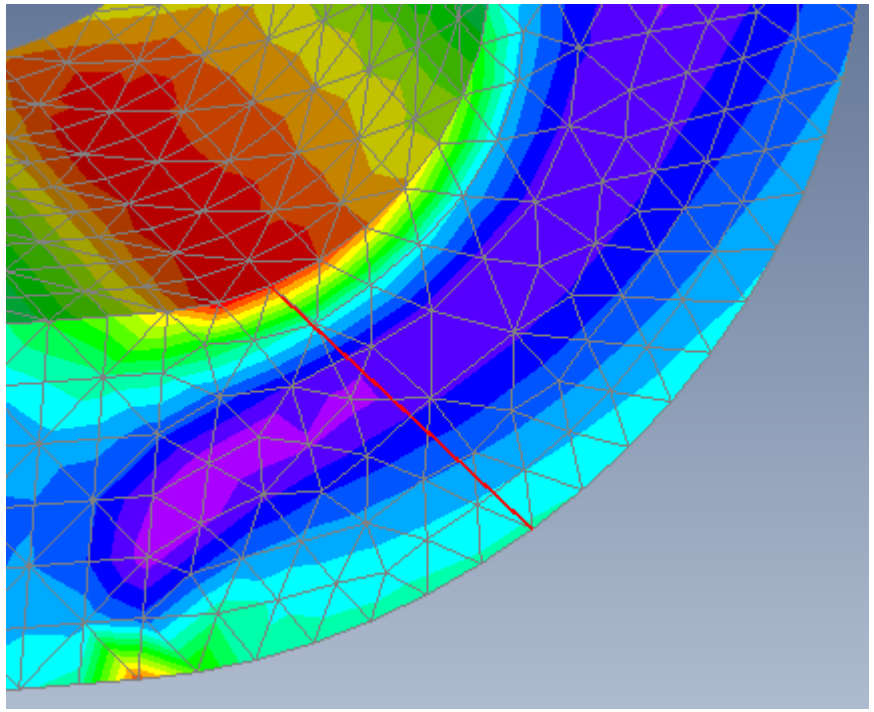
Simcenter Femap v2020.2 – What's New
Post-Processing

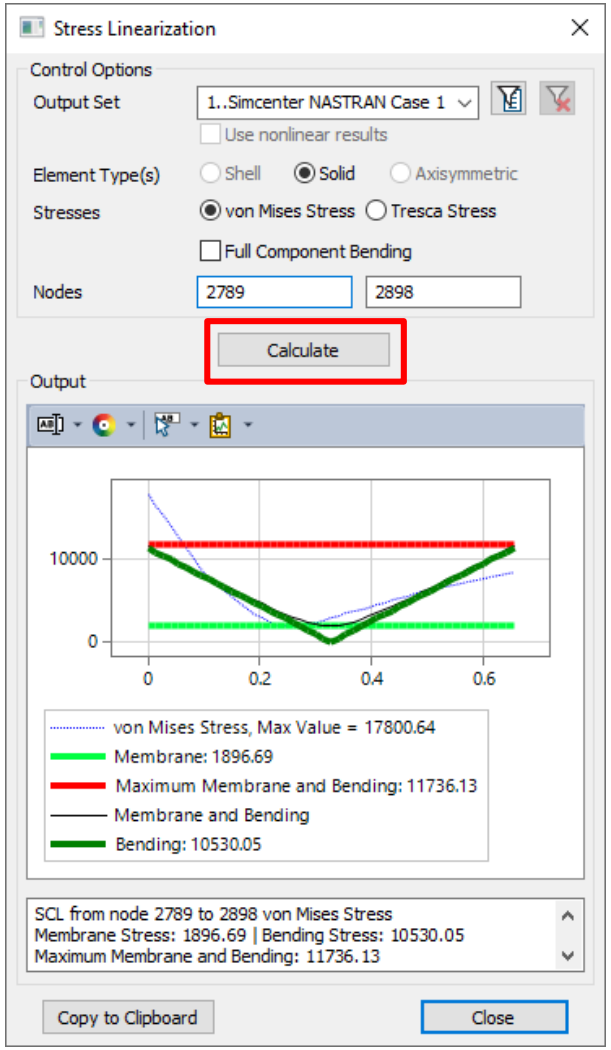
SIEMENS
Ingenuity for life

Stress Linearization

- ASME Boiler and Pressure Vessel Code, 2007 SECTION VIII, DIVISION 2, ANNEX 5.1 LINEARIZATION OF STRESS RESULTS FOR STRESS CLASSIFICATION

- Calculates a Linearized Membrane, Linearized Bending, and Peak Stresses along a Stress Classification (SCL)





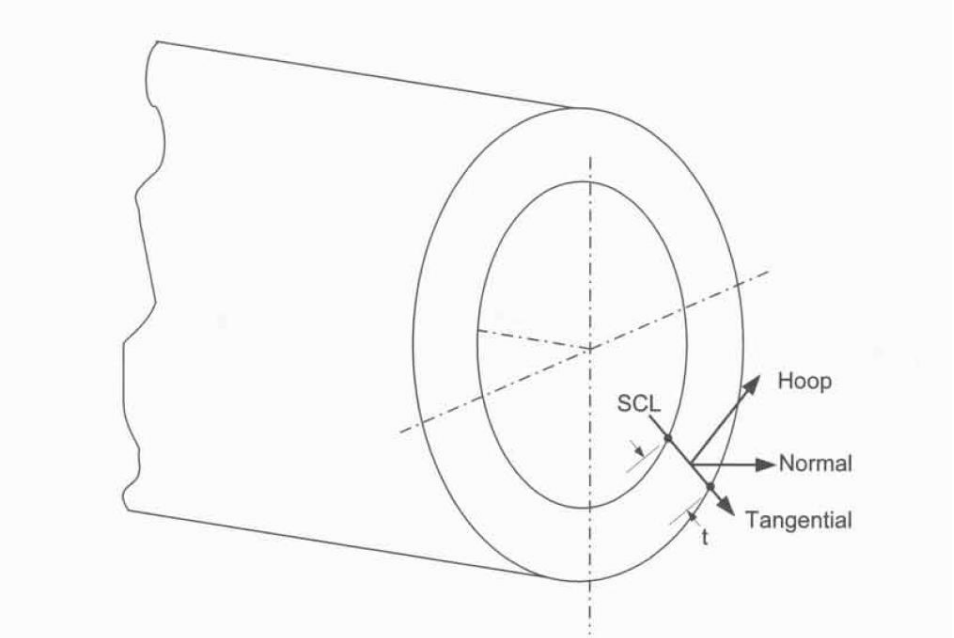
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Post-Processing

SIEMENS
Ingenuity for life

Stress Linearization Process per the ASME Code

- **Choice of the SCL is critical, user should be familiar with criteria for a proper SCL as defined in the ASME standard**
- Stress tensor extracted from the FEA results is transformed to be aligned with the SCL
- Linearized Membrane Stress tensor components are the average of each along the SCL
- Linearized Bending Stress tensor only includes Hoop and Normal axial stress, and Hoop/Normal shear stress



(a) SCL Orientation, Three-Dimensional Model

$$\sigma_{ij,m} = \frac{1}{t}\int_0^t \sigma_{ij}\,dx$$

$$\sigma_{ij,b} = \frac{6}{t^2}\int_0^t \sigma_{ij}\left(\frac{t}{2} - x\right)dx$$

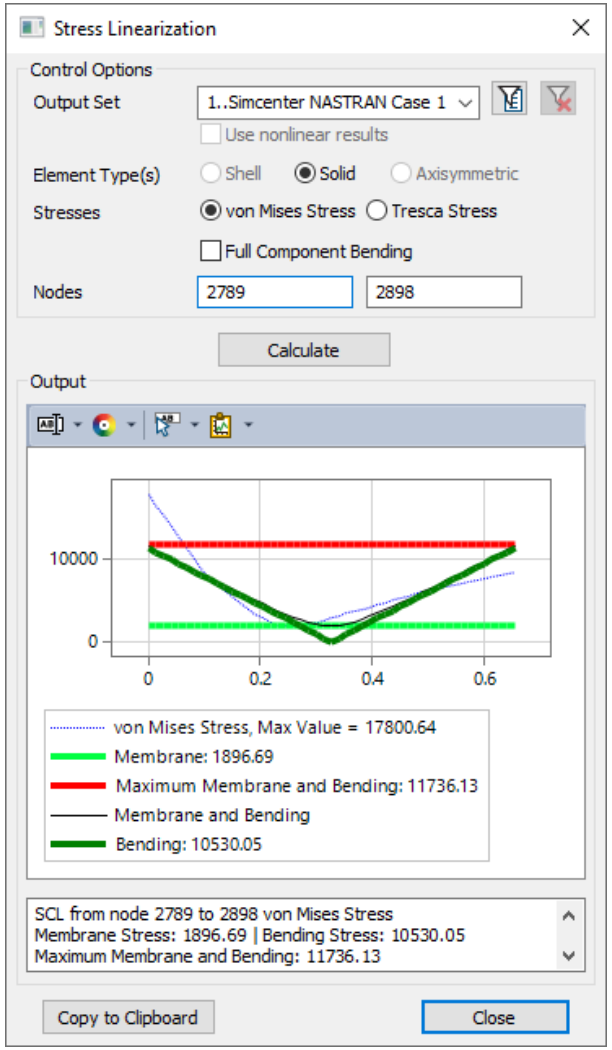
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Post-Processing

SIEMENS
Ingenuity for life

Stress Linearization Process in Femap

- Choose Output Set
- Choose Linear or Nonlinear Results for the Stress Tensor
- Element Type for Stress Data
- Von Mises or Tresca Stress
- Pick Nodes for the Stress Classification Line (SCL)
- Calculate



Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Post-Processing

SIEMENS
Ingenuity for life

Stress Linearization Results

- Chart showing the actual stress along the SCL
- Calculated Membrane, Bending, Membrane + Bending, Maximum Membrane + Bending
- Copy to Clipboard Option
- Exact Data values can also be copied from the Femap Chart

Stress Linearization

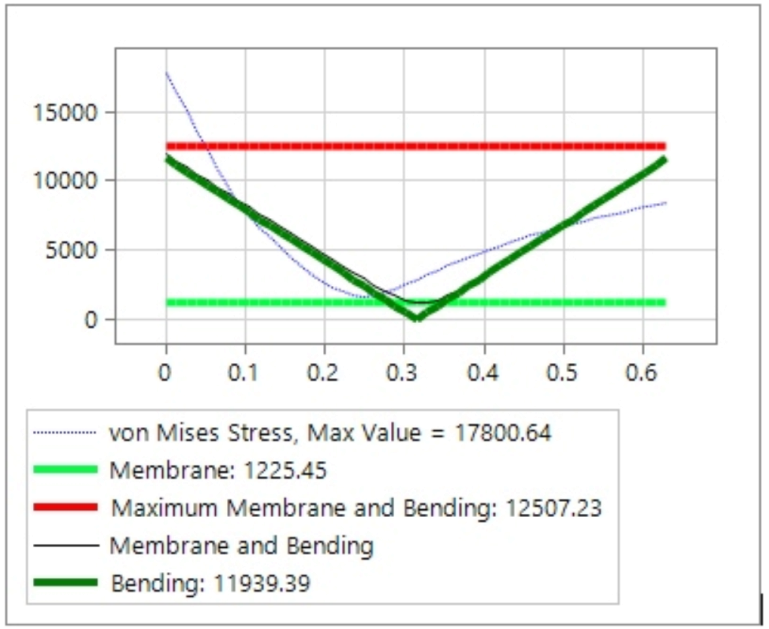
SCL from node 2789 to 2900 von Mises Stress

Membrane Stress: 1225.45 | Bending Stress: 11939.39

Maximum Membrane and Bending: 12507.23

Using Solid Linear Stress Data

Stresses have been transformed from the Material Direction to the SCL.



(Ctrl

Unrestricted © Siemens 2020

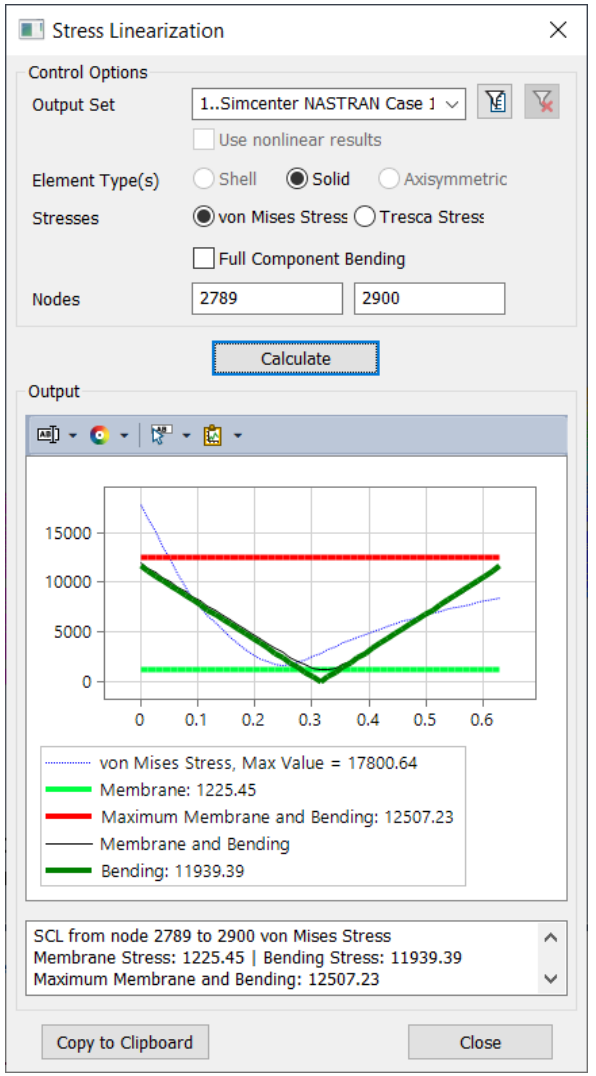
Simcenter Femap v2020.2 – What's New
Post-Processing

SIEMENS
Ingenuity for life

Stress Linearization Notes

- Full Component Bending option allows you to process the linearization with all components of the stress tensor considered for the bending stress calculations

- Tresca Stress – calculates a "Tresca" failure criterion stress value, which is based on the maximum shear stress, the Tresca Stress calculated by the tool is 2 times maximum shear

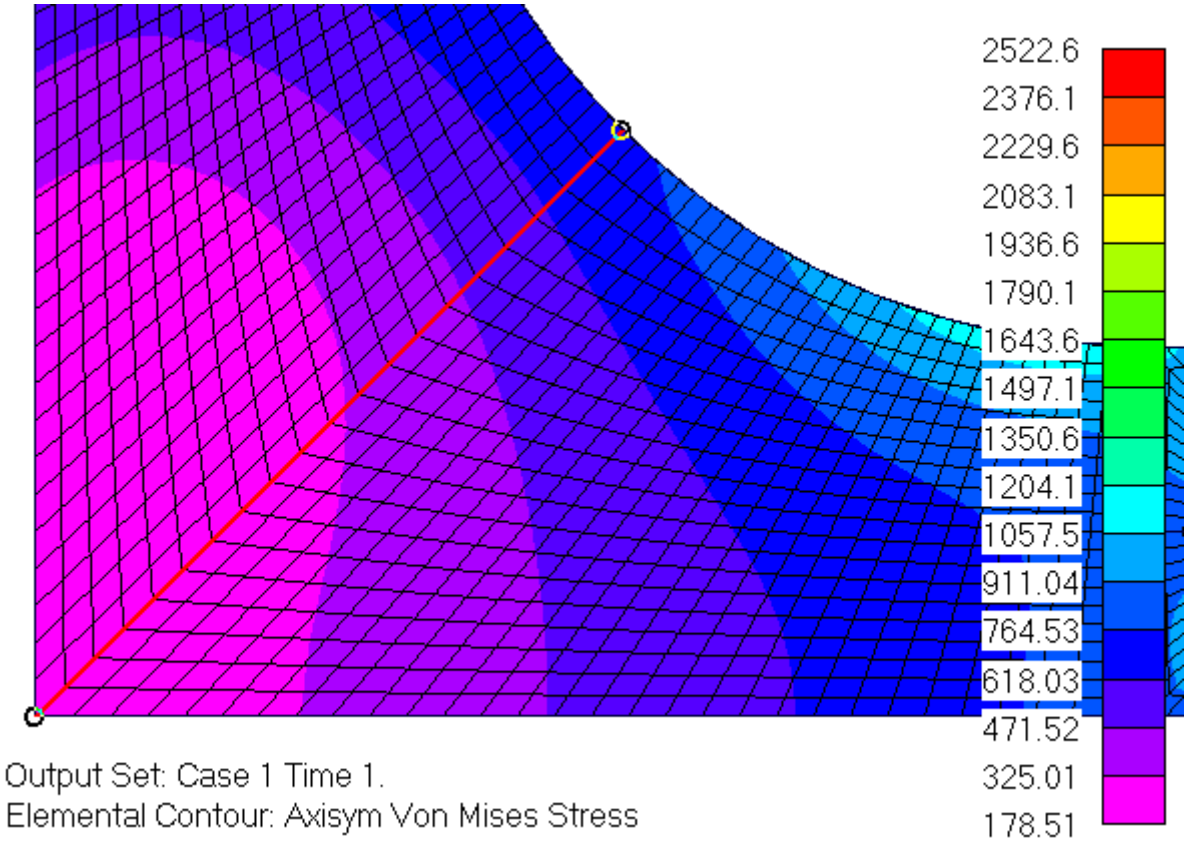


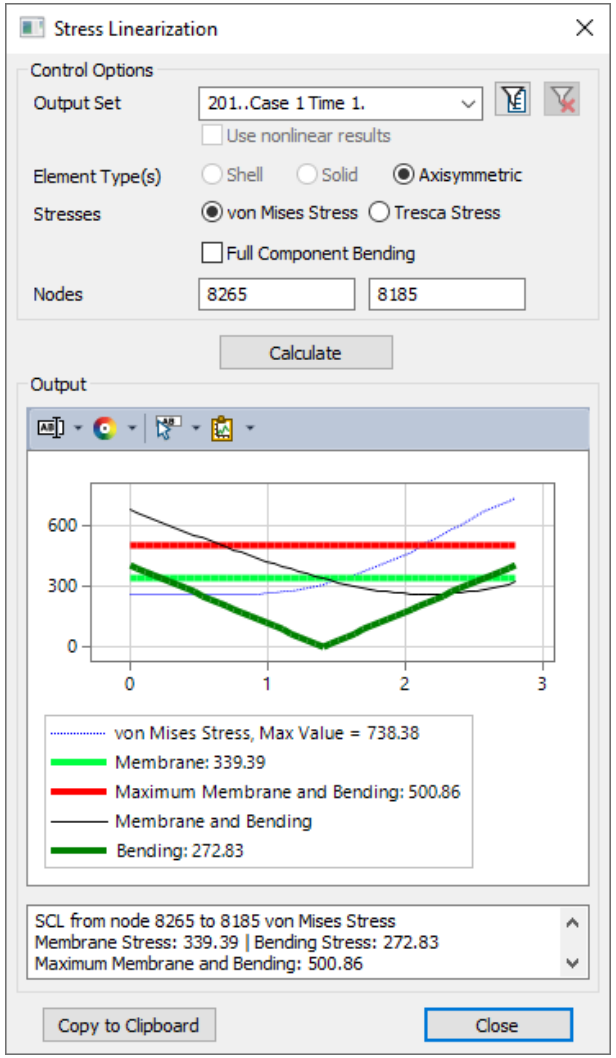
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Postprocessing

SIEMENS
Ingenuity for life

Stress Classification Line (SCL) from Node 8185 to Node 8265





Unrestricted © Siemens 2020

Agenda:

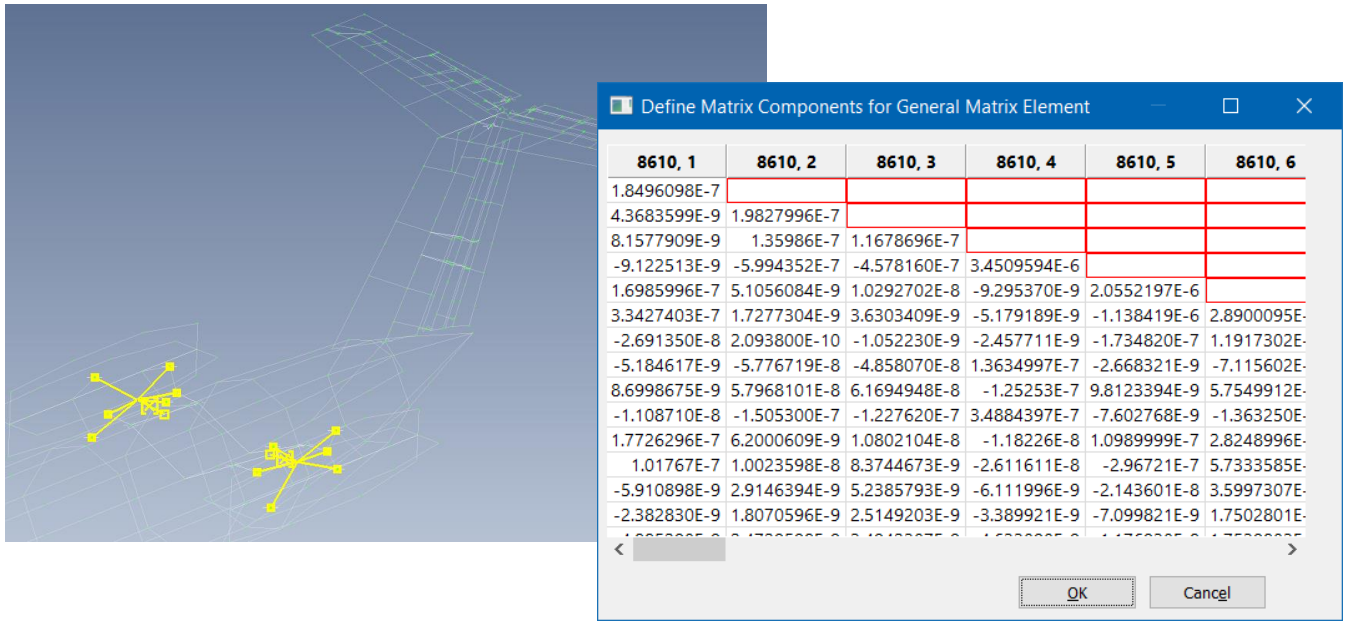
Performance Improvements
UI and Visualization
Preprocessing
Meshing
Post Processing
Solver Support
Miscellaneous

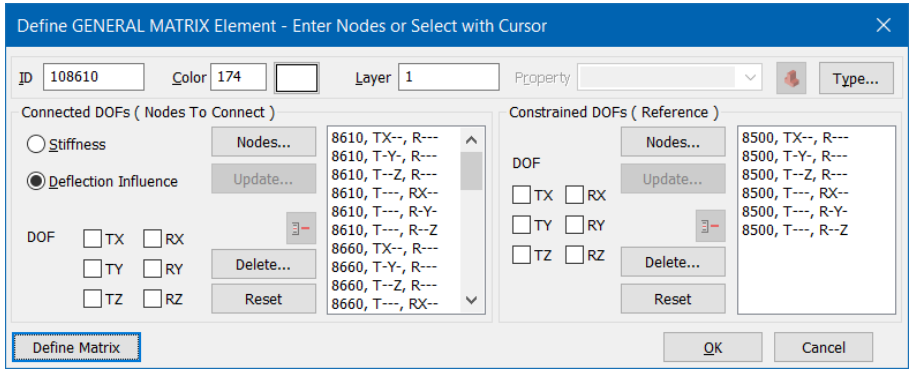
Simcenter Femap v2020.2 – What's New
Solver Support – Nastran Solvers

SIEMENS
Ingenuity for life

Added support for the General Element capability (GENEL)

- Define a substructure in terms of empirically-determined structural data
- Table interface for defining deflection influence or stiffness matrixes
- Graphical representation drawn that represents the connected DOFs connected to the constrained DOFs





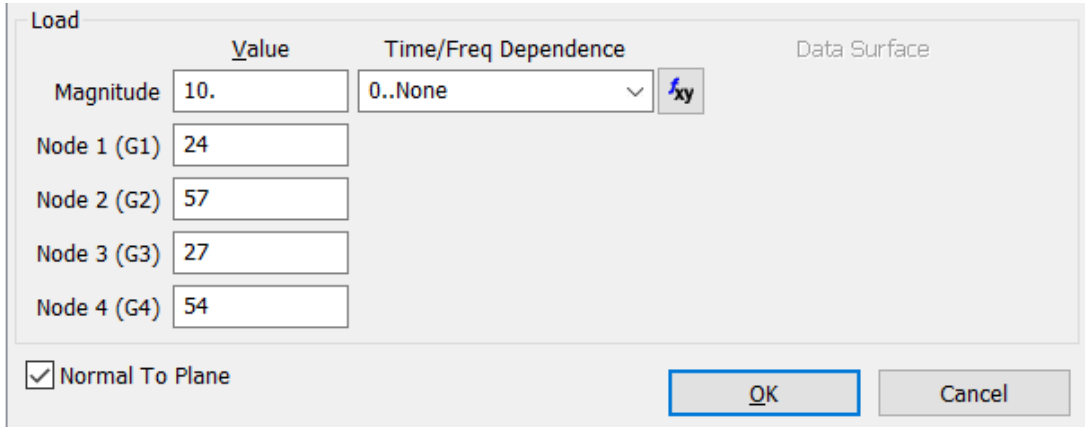
Unrestricted © Siemens 2020

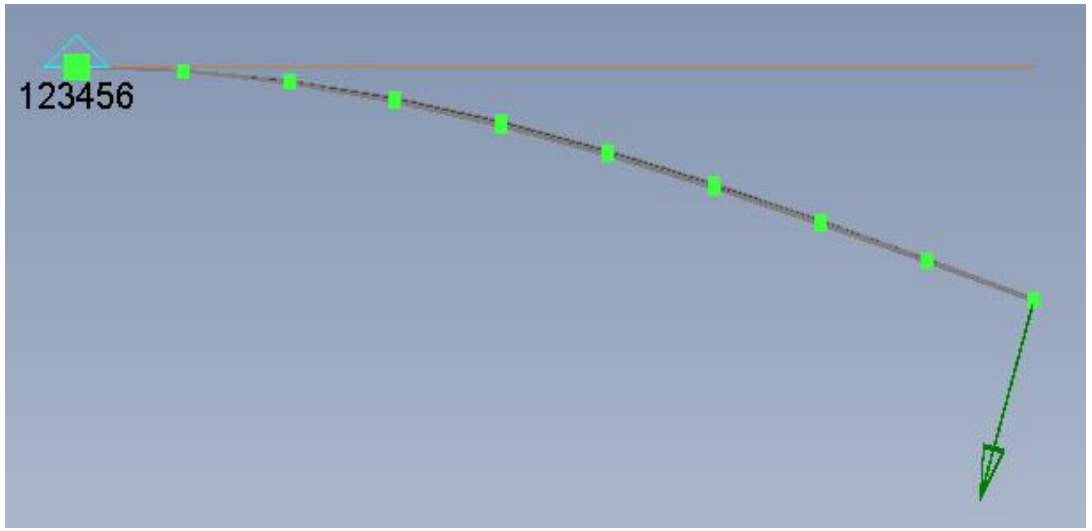
Simcenter Femap v2020.2 – What's New
Solver Support – Nastran Solvers

SIEMENS
Ingenuity for life

Added support for Follower Forces and Follower Moments

- When 2 nodes/points are specified to define the direction of the the load in terms of a vector, writes FORCE1 or MOMENT1
- When 4 nodes/points are specified to define the direction as normal to a plane, writes FORCE2 or MOMENT2
- Typically used by SOL 106, SOL 401, and SOL 402 for analysis which includes large deformation





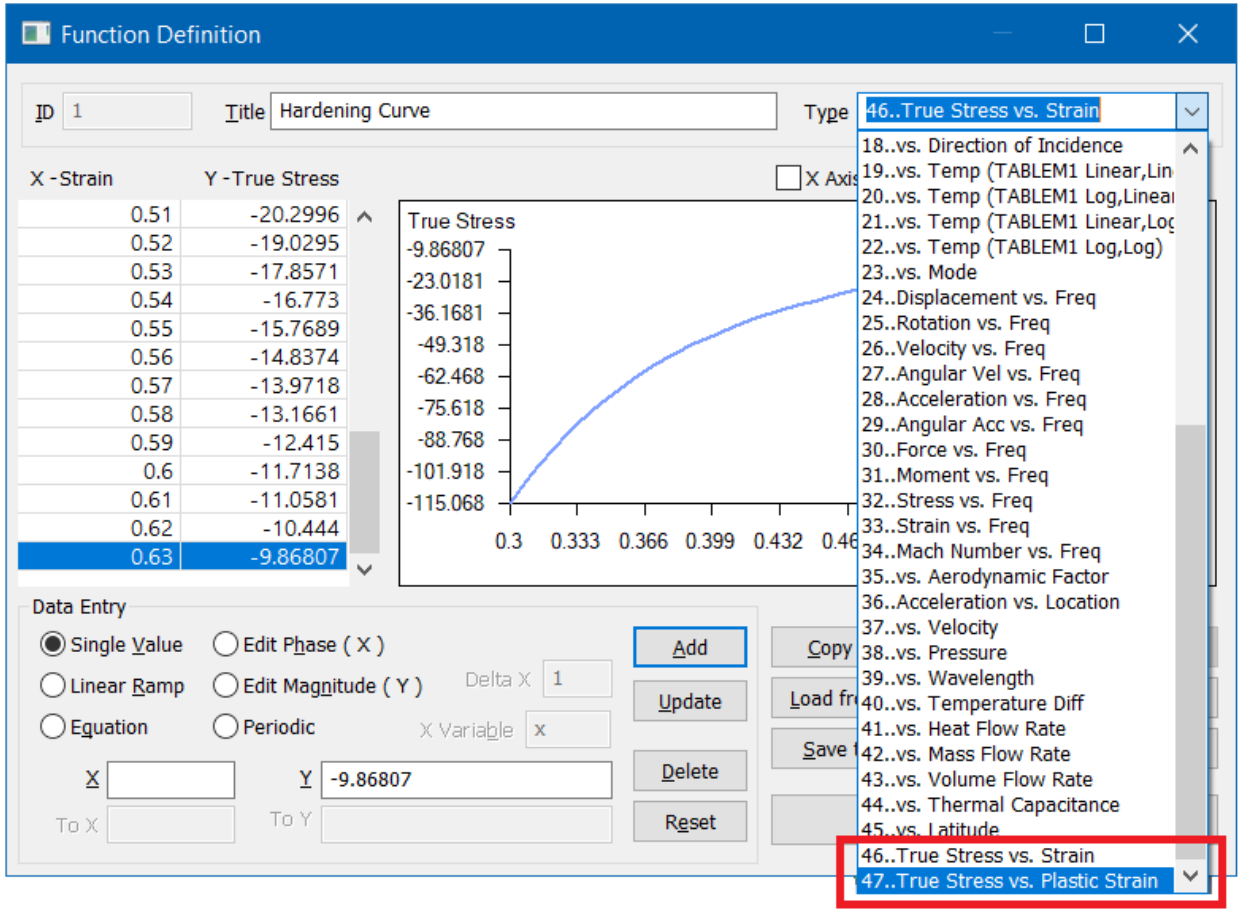
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Solver Support – Simcenter Nastran

SIEMENS
Ingenuity for life

Added new nonlinear contact and control parameters for SOL402

- New function types to specify type of exported stress-strain measures for SOL 402 (engineering vs. true)
- New option to consider thickness and Z-offset for shell elements involved in contact



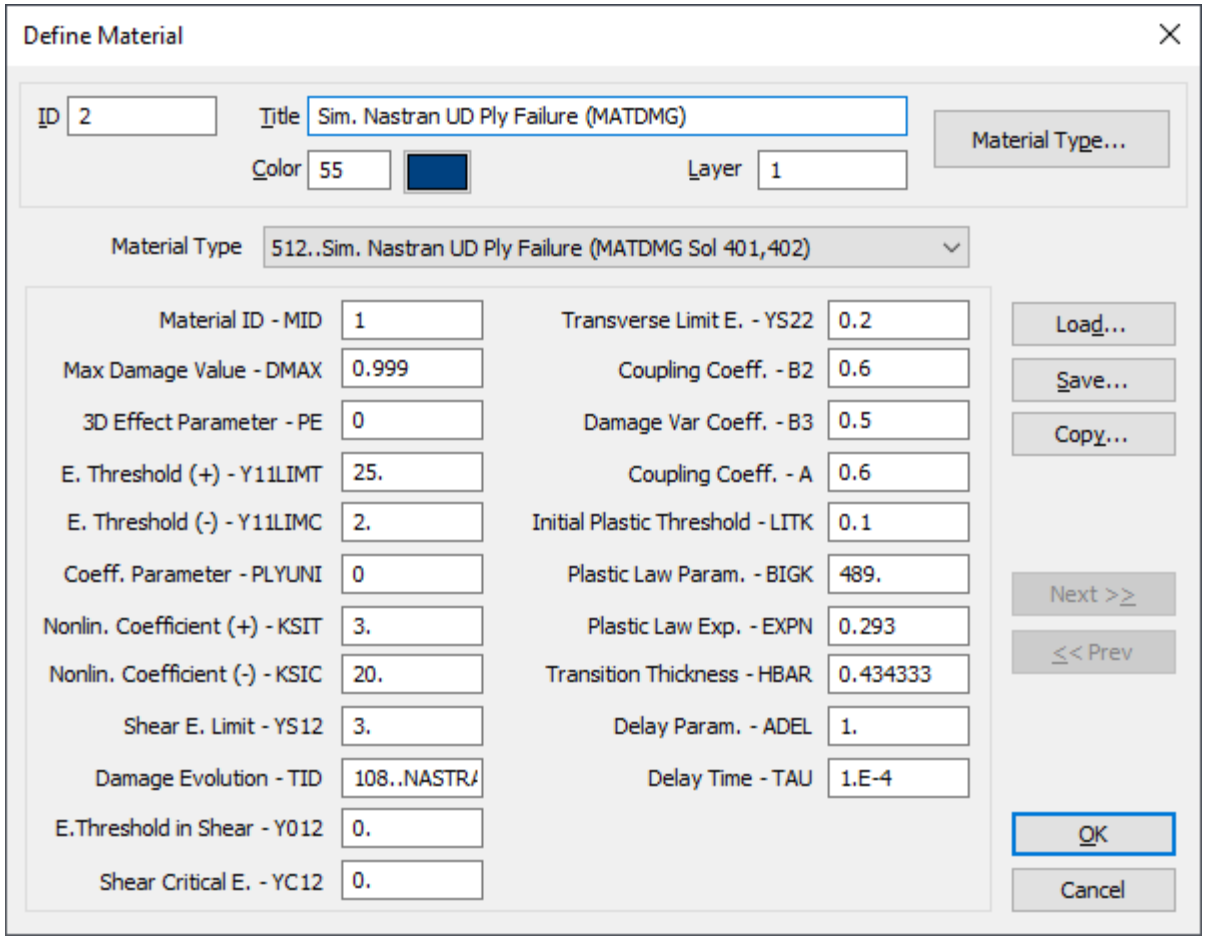
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Solver Support – Simcenter Nastran

SIEMENS
Ingenuity for life

Added support for modeling progressive ply failure for solid laminates (MATDMG)

- New material types to specify unidirectional fiber reinforced ply damage model and enhanced unidirectional ply damage model
- New function type to specify nonlinear damage evolution law for in-plane shear (shear damage vs thermodynamic force)
- Compute damage values, energy, status and crack density to predict failure



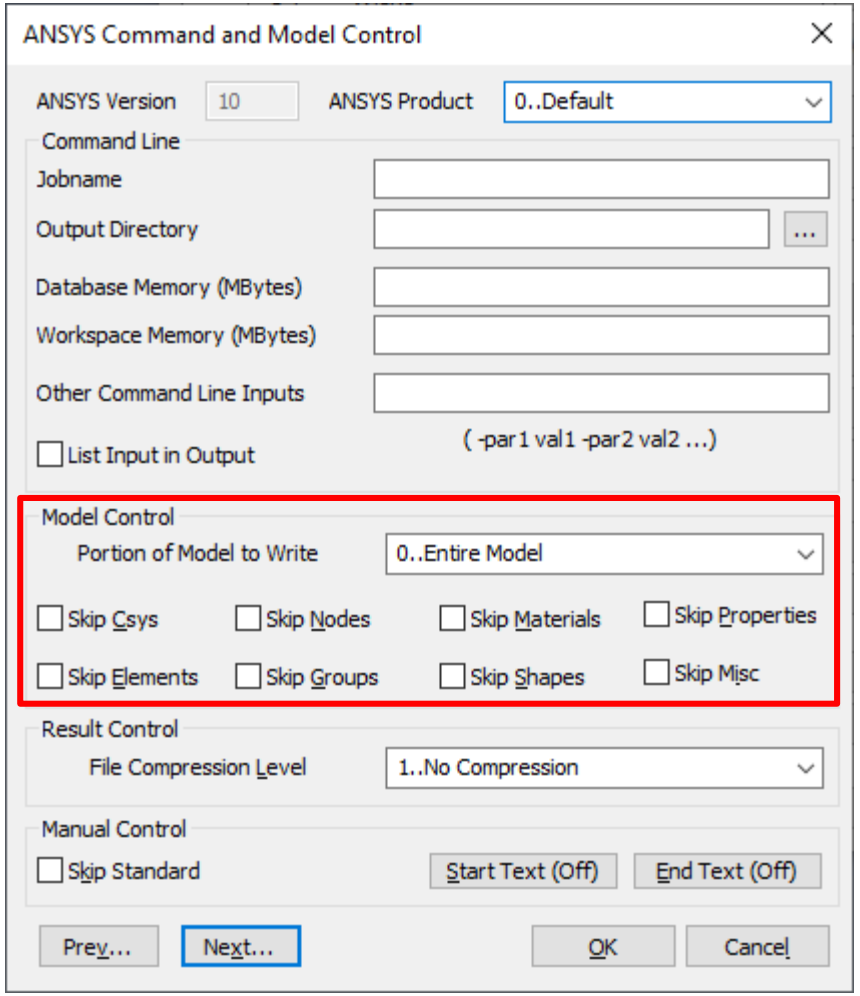
Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Solver Support – ANSYS Updates

SIEMENS
Ingenuity for life

Added several options to *Model Control* section of *ANSYS Command and Model Control* dialog box

- Added *Skip Csys*, *Skip Nodes*, *Skip Materials*, *Skip Properties*, and *Skip Elements* - allows user to skip any combination of these entity types entirely during export
- Added *Skip Groups* – allows user to skip writing ESEL, NSEL and CM entries during export
- Added *Skip Misc* – allows user to skip view settings (/VIEW, /ANGLE, /ZOOM, etc), preprocessor commands (/NOPR, /FCOMP, /PREP7, /GOPR, etc), solution settings (/SOLU, ANTYPE, EQSLV, etc), SOLVE, FINISH, etc
- Changed *Skip Beam/Bar Cross Sections* to *Skip Shapes*



Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Solver Support – ANSYS Updates

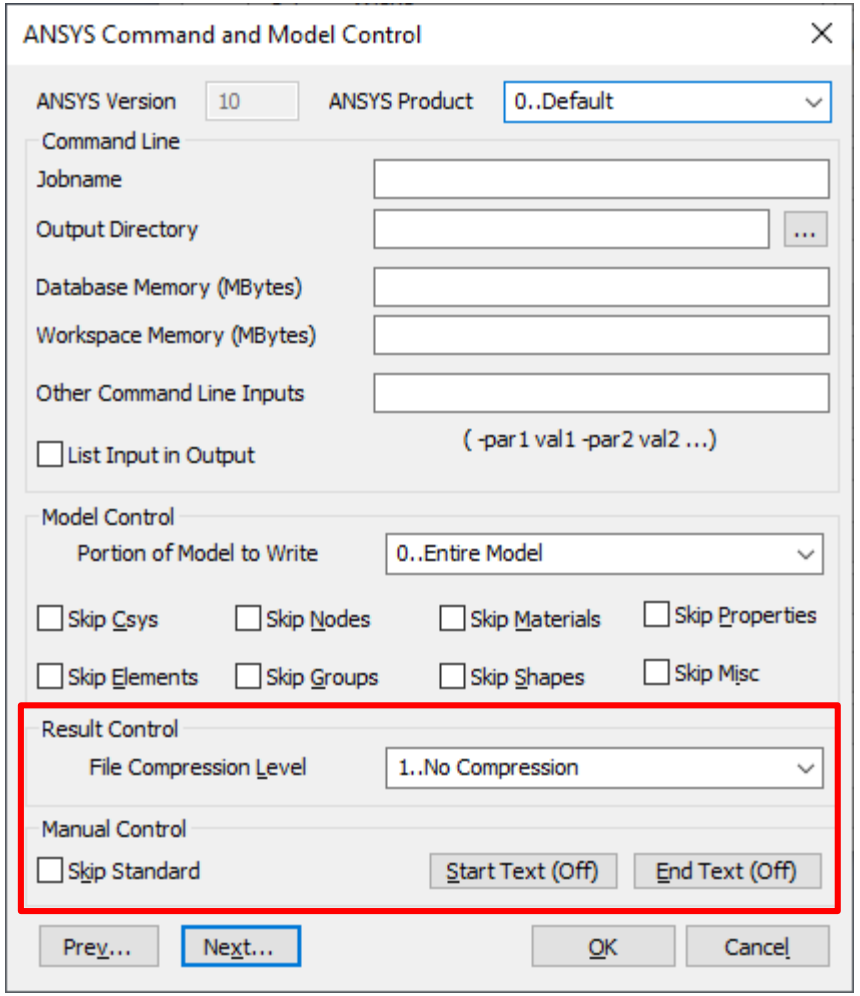
SIEMENS
Ingenuity for life

Added *Result Control* section to select the *File Compression Level* for the ANSYS results file (*.RST File)

Added ability to read output data contained in ANSYS results files which use "Version 1" compression (ANSYS default)

Added *Manual Control* section to:

- *ANSYS Command and Model Control*
- *ANSYS Load Step*
- *ANSYS Time Step Options*
- *ANSYS Modal Analysis Options*
- *ANSYS Harmonic Analysis Options*
- *ANSYS Random Vibration Analysis Options*
- *ANSYS Buckling Options*
- *ANSYS Nonlinear Options*
- *ANSYS Output Requests*

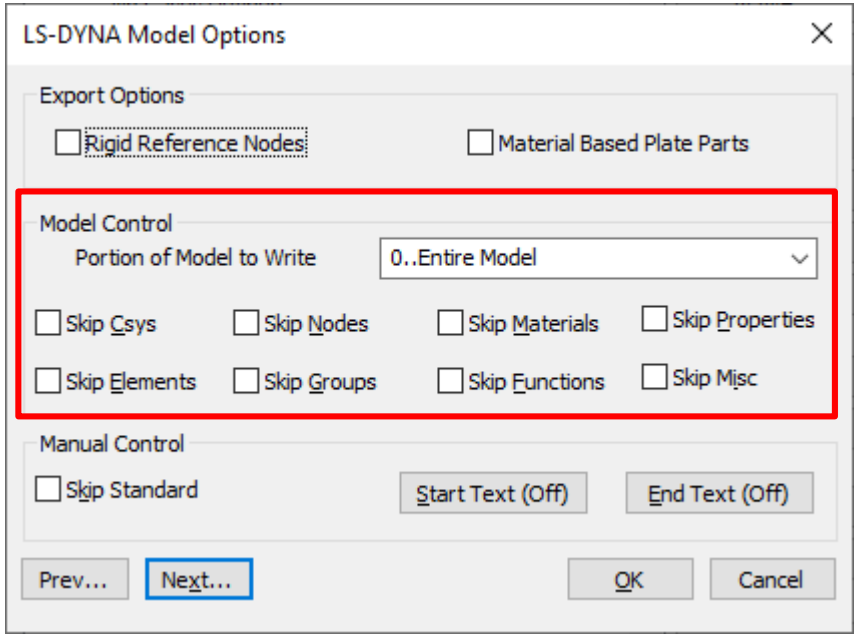


Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Solver Support – LS-Dyna Updates

SIEMENS
Ingenuity for life

Added several options to *Model Control* section of *LS-DYNA Model Option* dialog box



- Added *Skip Csys*, *Skip Nodes*, *Skip Materials*, *Skip Properties*, and *Skip Elements* - allows user to skip any combination of these entity types entirely during export
- Added *Skip Groups* – allows user to skip writing *SET_ entries during export
- Added *Skip Functions* – allows user to skip writing functions (*DEFINE_CURVE entries) during export
- Added *Skip Misc* – allows user to skip comments starting with "$", *KEYWORD, *TITLE with corresponding "title", *CONTROL TERMINATION with corresponding value, *DATABASE_BINARY_D3PLOT with corresponding value, *END, and other entries during export

Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
Solver Support – LS-Dyna and ABAQUS Updates

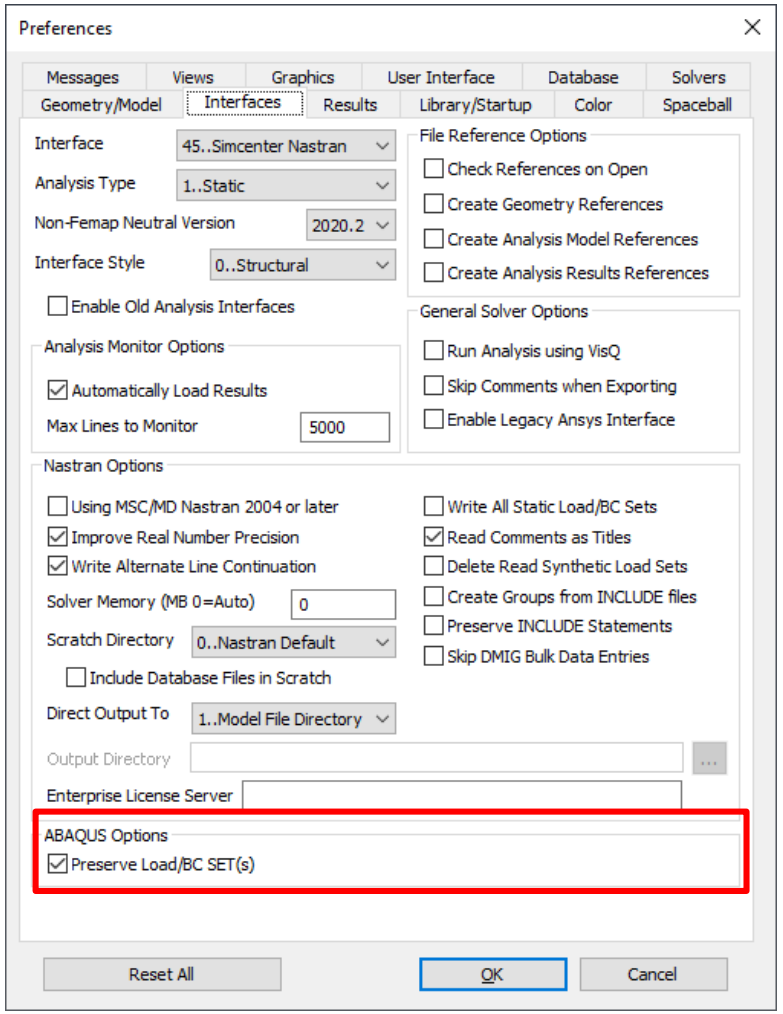
SIEMENS
Ingenuity for life

Added *LS-Dyna Analysis Monitor* to monitor solver progress, review solver files, and optionally import results

Added support *Preserve Load/BC Sets* option for ABAQUS

- When enabled, causes imported loads and boundary conditions which reference a SET to create a Load Definition or Constraint Definition in Femap

Added support to write all supported load/constraint types that are contained in a Load/Constraint Definition as a SET entry in the ABAQUS input file, if requested by enabling the *Write All Groups as Sets* option in the *ABAQUS Model Options* dialog box



Unrestricted © Siemens 2020

Agenda:

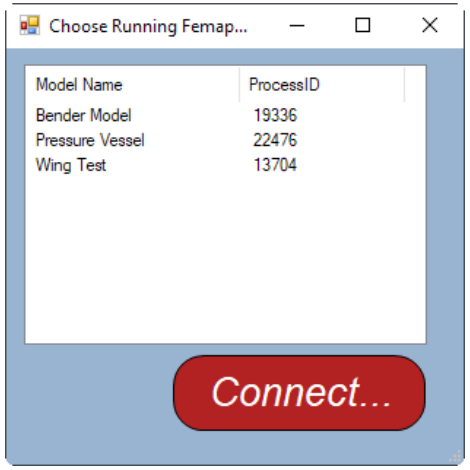
Performance Improvements
UI and Visualization
Preprocessing
Meshing
Post Processing
Solver Support
Miscellaneous

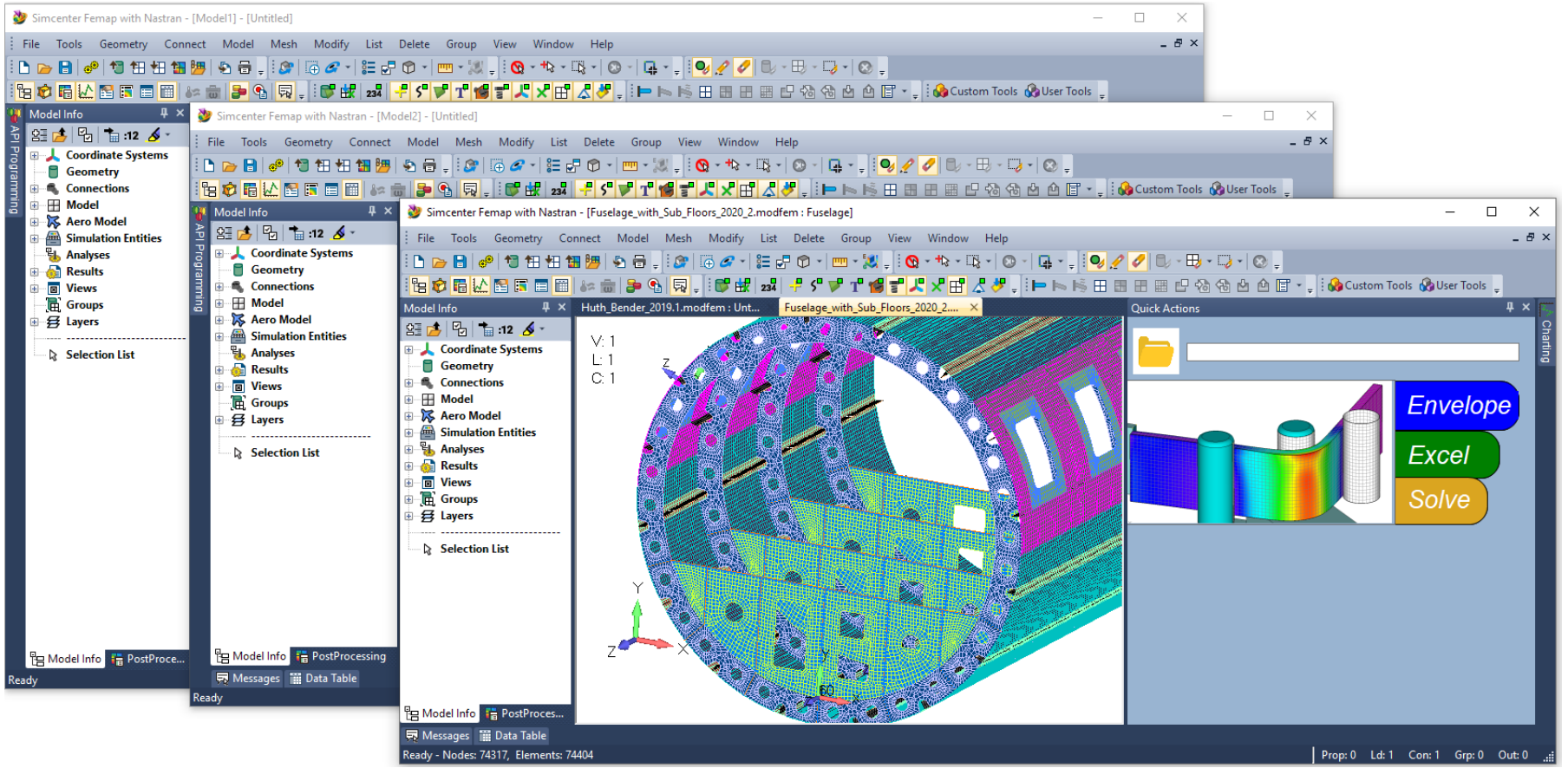
Simcenter Femap v2020.2 – What's New
API – Control Multiple Femap Sessions

SIEMENS
Ingenuity for life

- API Developers can now control multiple Femap sessions ***simultaneously***
- Including **Excel** VBA Developers
- Forward-compatible

- `feAppRunningApplicationInfo()`
- `feAppGetRunningApplication()`





Unrestricted © Siemens 2020

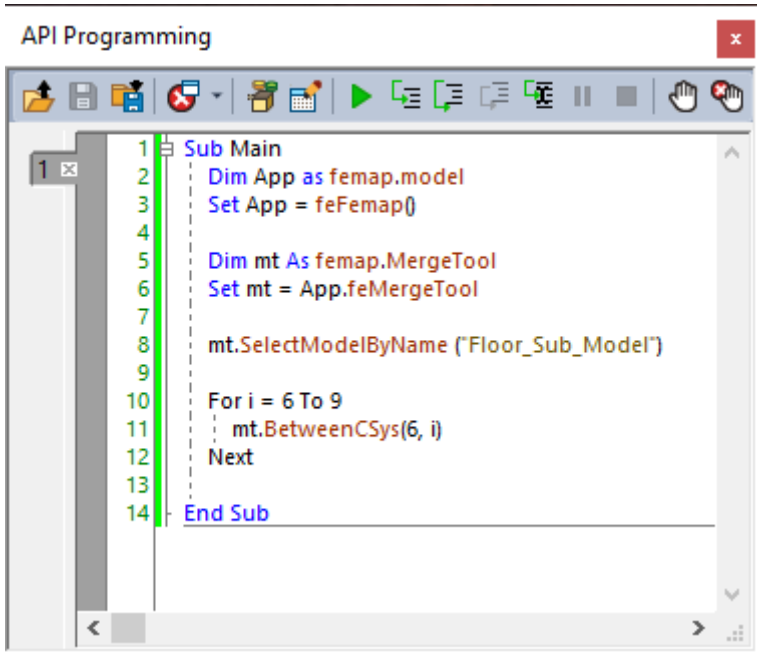
Simcenter Femap v2020.2 – What's New
API

SIEMENS
Ingenuity for life

New Tools

- Added a MergeTool Object (feMergeTool) that is similar to the existing CopyTool and MoveTool, but exposes the capabilities of the File->Merge Command

  - Ability to select *From Model* by name
  - Methods to toggle individual/groups of entity types to include
  - Method to "Add Related" entities with "Add Associated" option
  - Unique methods for each *Orientation/Transform* option
  - Properties to specify *Options*
  - Methods to create "Patterns" of merged entities (not in UI)



Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New API

SIEMENS
Ingenuity for life

Stress Linearization API Access

- Automate processing of different Stress Linearization scenarios
- Same options as GUI version

```
Sub Main
    Dim App as femap.model
    Set App = feFemap()

    Dim fSL As femap.StressLinear
    Set fSL = App.feStressLinear

    fSL.ouSetID = 1
    fSL.nElemType = 0
    fSL.ndID1 = 2789
    fSL.ndID2 = 2900
    fSL.bNonlinearMode = False
    fSL.bFullStressTensor = False

    If fSL.CalcStressLinearization() = FE_OK Then
        Msg = "Maximum Stress = " +Str$(fSL.dMaxStress)
        App.feAppMessage( FCM_NORMAL, Msg )
        Msg = "Membrane Stress = " + Str$(fSL.dMembraneStress)
        App.feAppMessage( FCM_NORMAL, Msg )
        Msg = "Bending Stress = " + Str$(fSL.dBendingStress )
        App.feAppMessage( FCM_NORMAL, Msg )
    End If

End Sub
```

Output from API Script:

Maximum Stress = 17800.6378136816
Membrane Stress = 1225.44895224937
Bending Stress = 11939.3928698333

Unrestricted © Siemens 2020

Simcenter Femap v2020.2 – What's New
API

SIEMENS
Ingenuity for life

New Application Methods

- Added feFileGetByName( ) that returns Model ID of an open model based on its filename.

- Added feEdgesOfFreeFaces( ) that returns pairs of node IDs along the edges of Free Faces of selected elements.

New Object Methods

- Added NextOnEntity( ) method to the LoadGeom, LoadMesh and BCGeom objects and NextOnNode( ) to the BCEqn object. These new methods allow you to retrieve multiple loads/constraints of different types on multiple entities.

- Added AddNodesOnFreeEdges( ) and AddNodesOnFreeFaces( ) to the Set object that add nodes on free edges or faces of selected elements to the Set.

- Added ComputeStdShape2( ) and ComputeGeneralShape2( ) to the Property object that allow you to specify whether to compute properties at End A or End B of a tapered beam property.

Unrestricted © Siemens 2020

Contact Us

13290 Evening Creek Drive S
San Diego, CA 92128

(858) 480-2000

plm_sales@ata-e.com

www.ata-e.com
www.ata-plmsoftware.com

@ATAEngineering

ata-engineering