

PRIMER 22.1

PRIMER 22.1 – Contents

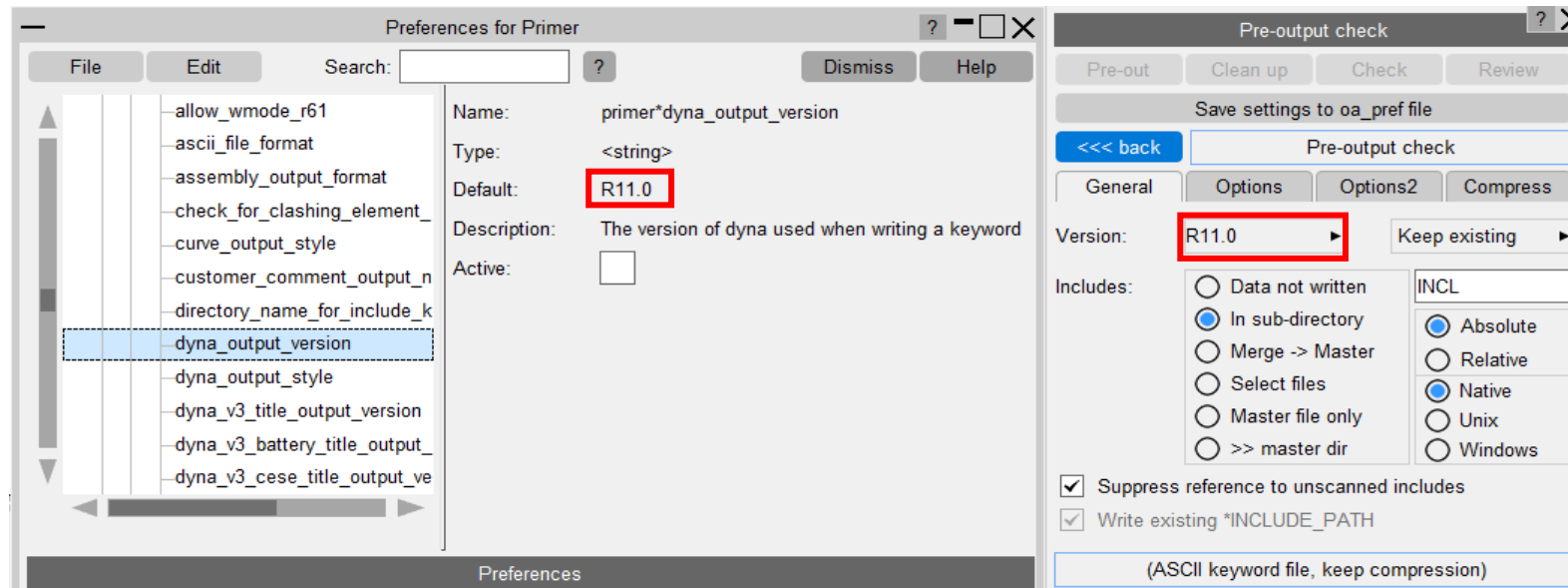
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Complete Ansys LS-DYNA Support

Keyword support including
***AIRBAG_CPG**

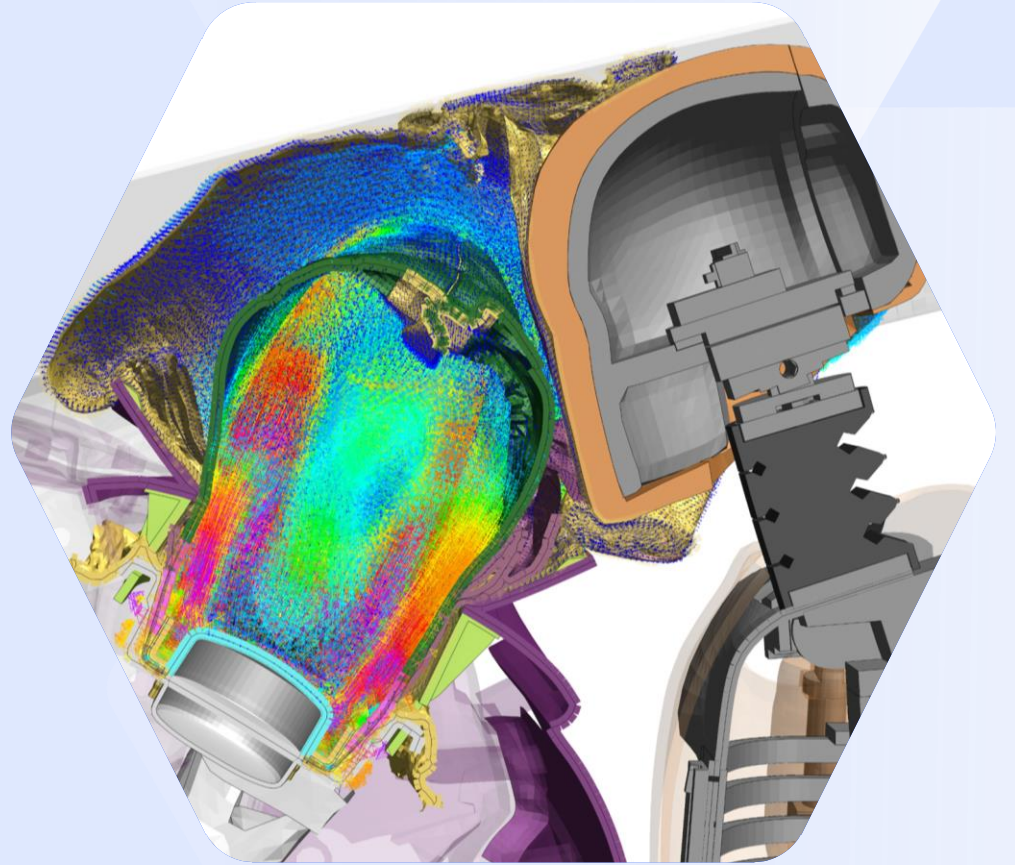
Ansys LS-DYNA Keyword Support

- PRIMER 22.0 keywords:
 - Ansys LS-DYNA keywords up to and including R15.0 fully supported (excluding ***ISPG**).
 - Some Ansys LS-DYNA R16.0 additions and modifications to commonly used keywords supported.
 - Default output version remains R11.0 (later versions including R16.0 can be selected).



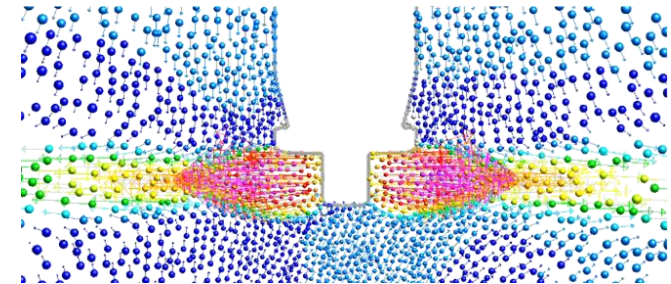
Support for *AIRBAG_CPG

A New Airbag Gas Solver



Support for Continuum-based Particle Gas (CPG)

- CPG is a new continuum-based particle approach for airbag simulations, available from Ansys LS-DYNA 2025R1 (R16).
- As a fully functional fluid solver, CPG is more effective at simulating gas flow than the corpuscular particle method (CPM), and more capable at internal fluid-structure interaction than ALE.
- Key features:
 - Compressible Navier-Stokes solver coupled with an ideal gas equation of state.
 - Meshless by design, based on a generalized finite-difference scheme.
 - Particle cloud fills airbag volume, gas passes from particle to particle (Eulerian approach).
 - Particles added or removed only when necessary.
 - Excellent accuracy, robustness & scalability to hundreds of cores.
- Designed for airbag simulation, validated by airbag CAE engineers:
 - Simple *AIRBAG_CPG keyword format that copies other *AIRBAG_ types. Same input data for inflators, fabric, etc.
 - First release supports internal structures, simple venting, fabric porosity, multiple gases/orifices/inflators, moving environment, local particle refinement, and more.
 - Inviscid with free-slip boundary by default, although viscosity and wall friction available.
- CPG is destined to take airbag simulation to the next level required for virtual testing, however accurate input data and well folded models are also vital to achieve useful results.

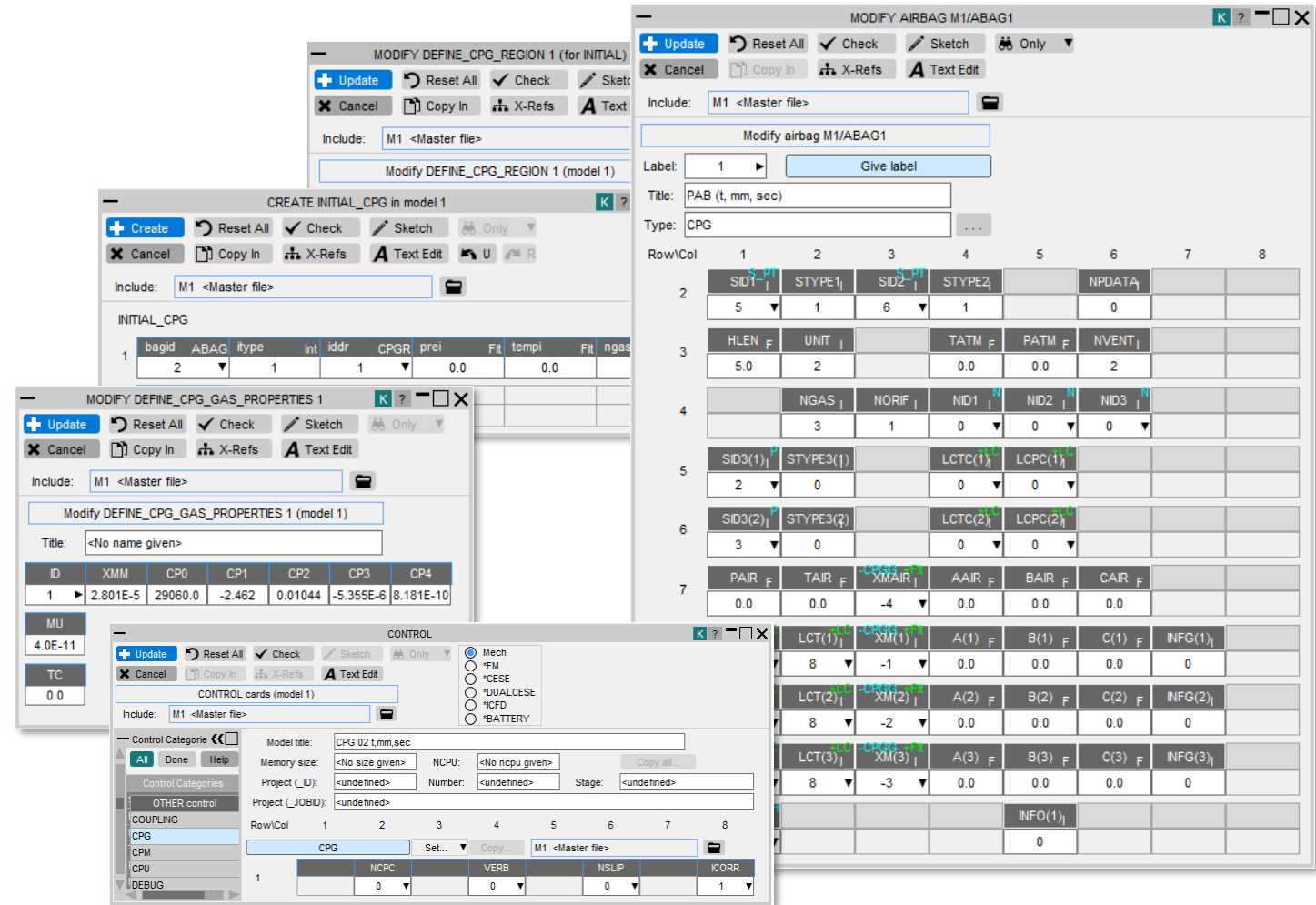
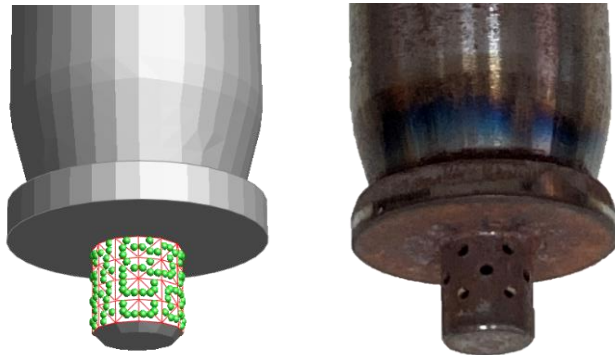


Support for CPG Keyword Input in PRIMER

We work closely with Ansys to ensure that the Oasys LS-DYNA Environment is the leading choice for CPG workflows

- PRIMER 22.0 supports all CPG-related R16.0 keywords:

- *AIRBAG_CPG**
- *DEFINE_CPG_GAS_PROPERTIES**
- *CONTROL_CPG**
- *DEFINE_CPG_REGION**
- *INITIAL_CPG**
- *MESH_SIZE_SHAPE**



Improvements to Include File Handling

***INCLUDE** files skipped during input are now remembered

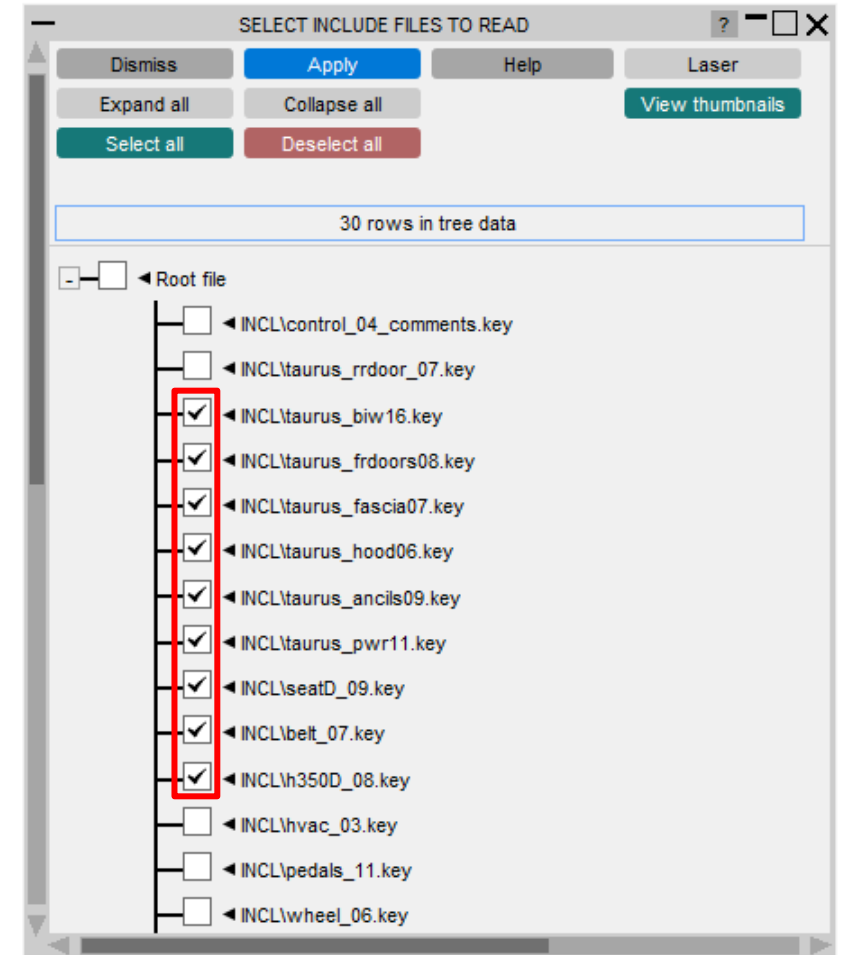
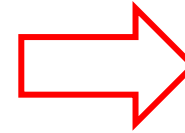
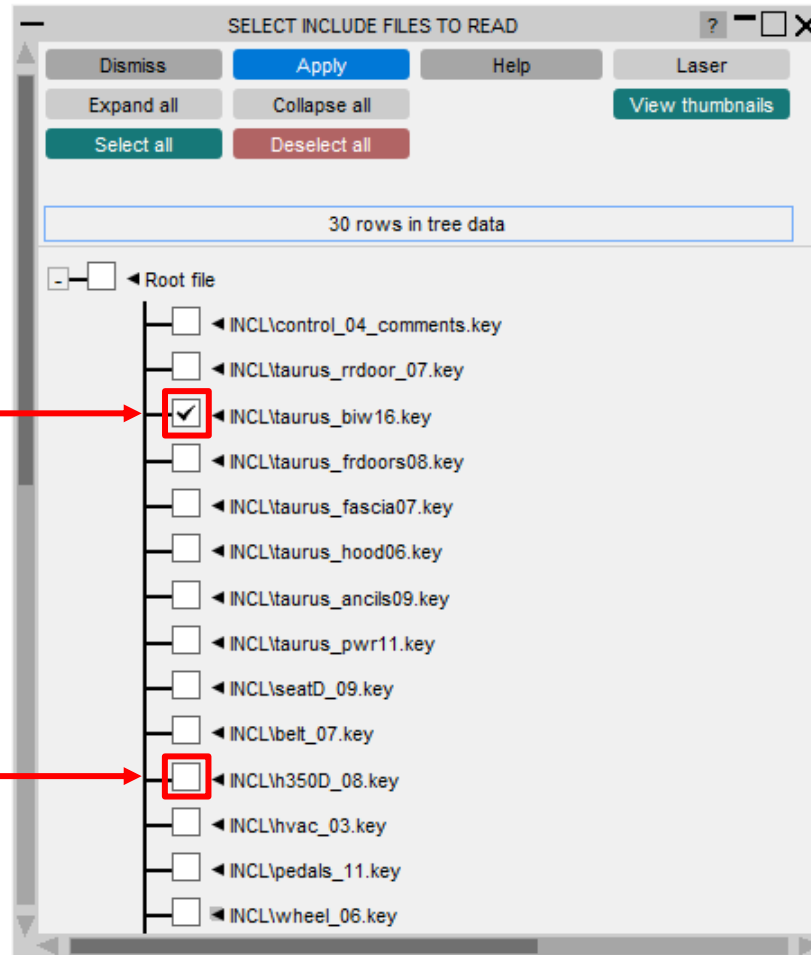
- When an ***INCLUDE** file cannot be found during keyword input PRIMER has always allowed you to skip it and continue the input process. However, that keyword file was ‘forgotten’: it would not appear in PRIMER’s include tree and no ***INCLUDE** statement would be written in its parent file during keyword output.
- PRIMER 22.0 now remembers these files by default:
 - They will appear in the include tree, and in the part tree in ‘include’ mode.
 - An ***INCLUDE** statement will appear in the parent keyword output file, but no child include file will be output.
- It is possible to control this behaviour using the preference:

```
primer*missing_include_file_action:    remember    |    forget
```

Shift+click is now supported for selecting ***INCLUDE** files

1. Click on include file

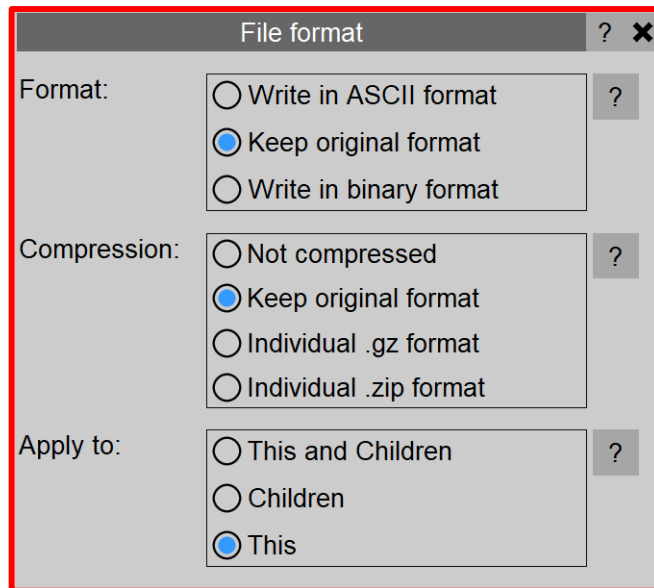
2. Shift click on second include



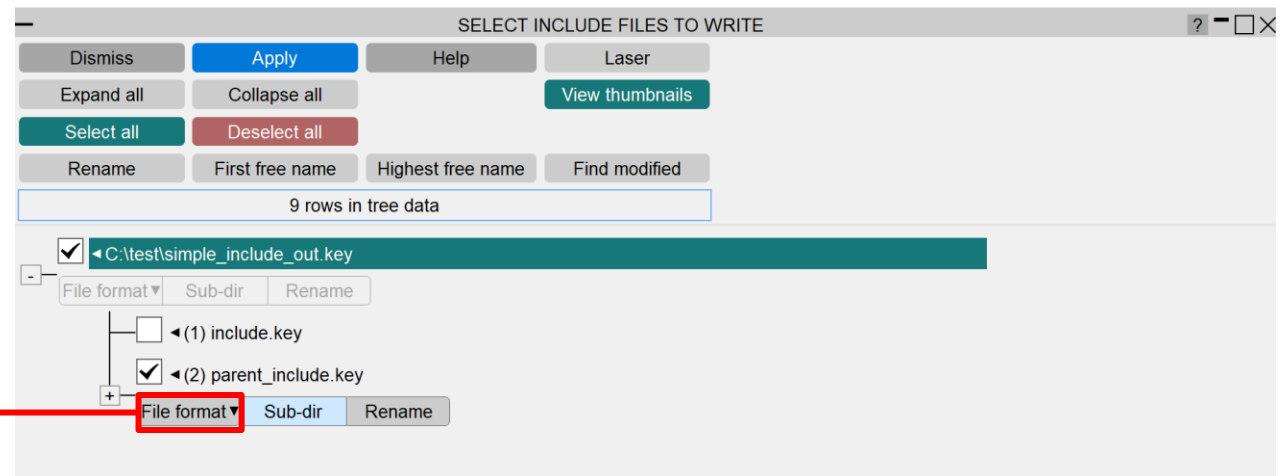
All include files between clicks are (de)selected.
Supported for reading and writing include files

Ability to select formats per include file

- Added a File format option to map the file format panel in SELECT INCLUDE FILES TO WRITE window. This can be used to select different formats (ASCII/Binary/Compression) per include file while writing out.



The 'File format' dialog box is shown with a red border. It contains three sections: 'Format' with radio buttons for 'Write in ASCII format', 'Keep original format' (selected), and 'Write in binary format'; 'Compression' with radio buttons for 'Not compressed', 'Keep original format' (selected), 'Individual .gz format', and 'Individual .zip format'; and 'Apply to' with radio buttons for 'This and Children', 'Children', and 'This' (selected). Each section has a question mark icon to its right.



***TITLE** and Includes

- Previous versions of PRIMER only supported writing of ***TITLE** cards to master models
- If multiple ***TITLE** cards were read in (irrespective of whether they were from the input master or input includes), the last one would take precedence and would then become the master model's title

Previous versions

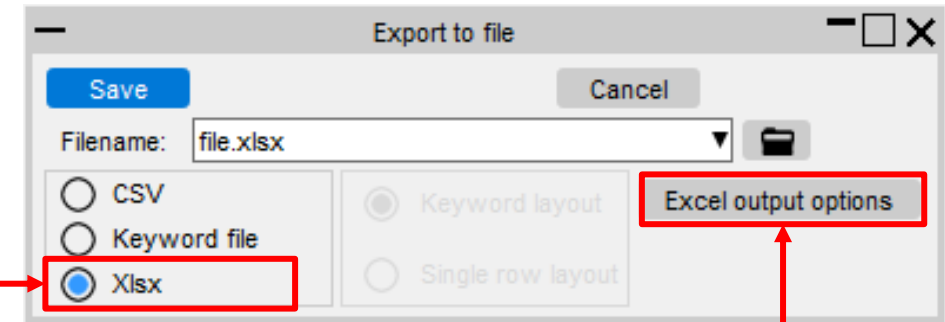
- PRIMER 22.0 adds per-include support for ***TITLE**
- Each include (as well as the master model) can now have its own ***TITLE** card

PRIMER 22.0

Keyword Output to Excel

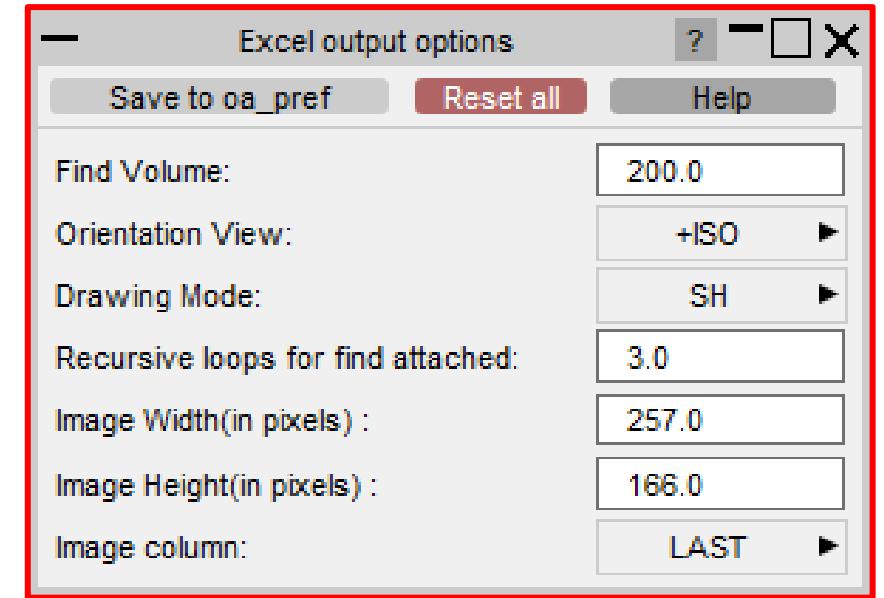
Writing Keyword Definitions in Excel format

- PRIMER 22.0 includes a new option to write keyword definitions to Xlsx format. This can be accessed in the following way:
 - From the Keyword editor, select the keyword row(s);
 - Right-click and choose the **Export File** option;
 - Select **Xlsx** using the radio button.
- This export to Xlsx functionality is available for all keywords.
- Some keywords come with additional options that allow users to capture images, similar to the existing **Contact > Write** options feature.
- Settings for capturing images for selected database keywords can be accessed via the Excel output options button.



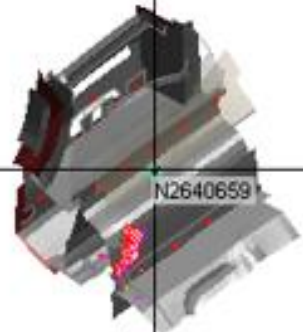

Excel output options for Images

- Images can currently be captured for the following keywords:
 - ***DATABASE_HISTORY_NODE**
 - ***DATABASE_HISTORY_BEAM**
 - ***DATABASE_CROSS_SECTION**
- Excel output options panel allows users to set:
 - Orientation view
 - Drawing mode
 - Image column position in the Excel file
 - Image width and height
- Find Volume is input for ***DATABASE_HISTORY_NODE**.
- Recursive loops for find attached is input for ***DATABASE_HISTORY_BEAM**.




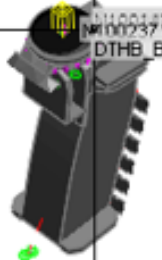
Writing Keyword Definitions and Images in Excel Format

- ***DATABASE_HISTORY_NODE:**
 - Image based on items found within a cube volume centred on the node.
 - The input value (Find Volume) defines the cube volume for the search.

ID	TITLE	History Node Thumbnail	
2640659	accelerometer: 1	PRIMER: MY: DEMO	
		PRIMER: MY: DEMO	

Writing Keyword Definitions and Images in Excel Format

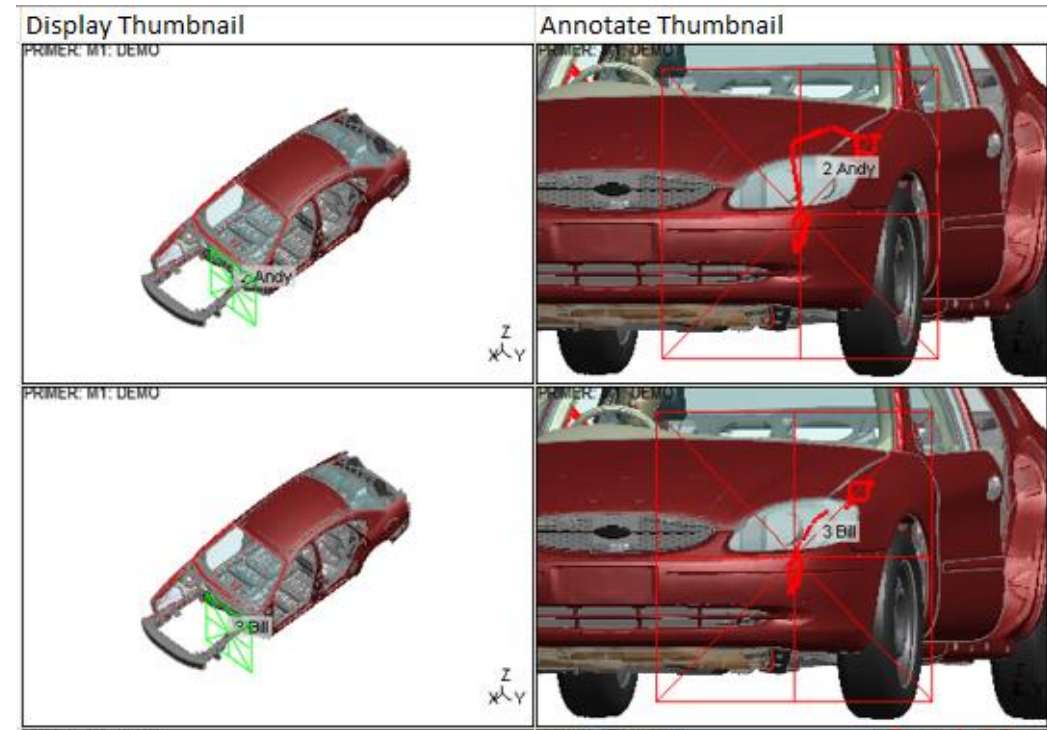
- ***DATABASE_HISTORY_BEAM:**
 - Based on number of recursions applied to attached items around the beam.

ID	History Beam Thumbnail	
100000	PRIMER: MY: DEMO	
100001	PRIMER: MY: DEMO	

Writing Keyword Definitions and Images in Excel Format

- ***DATABASE_CROSS_SECTION:**

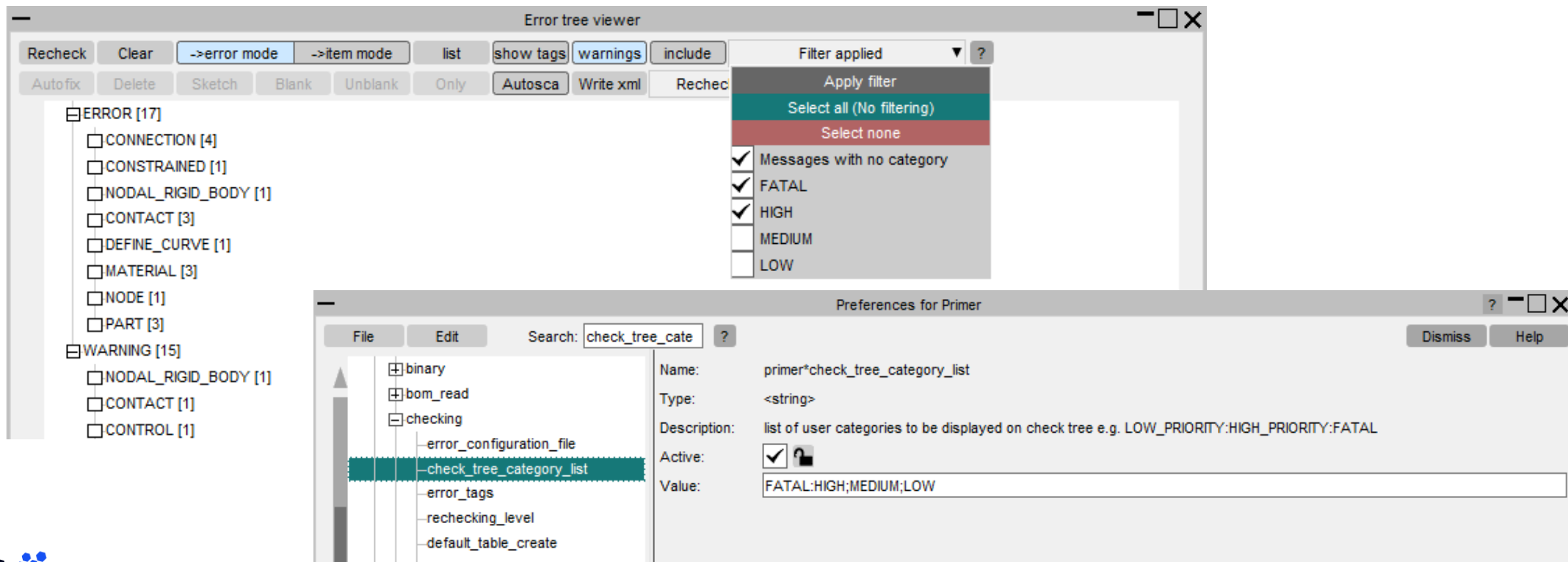
- 'Display' and 'Annotate' images are output.
- Annotate: Output zoomed-in view of the cross-section with the cross-section plane parallel to the screen.



User Defined Error Categories

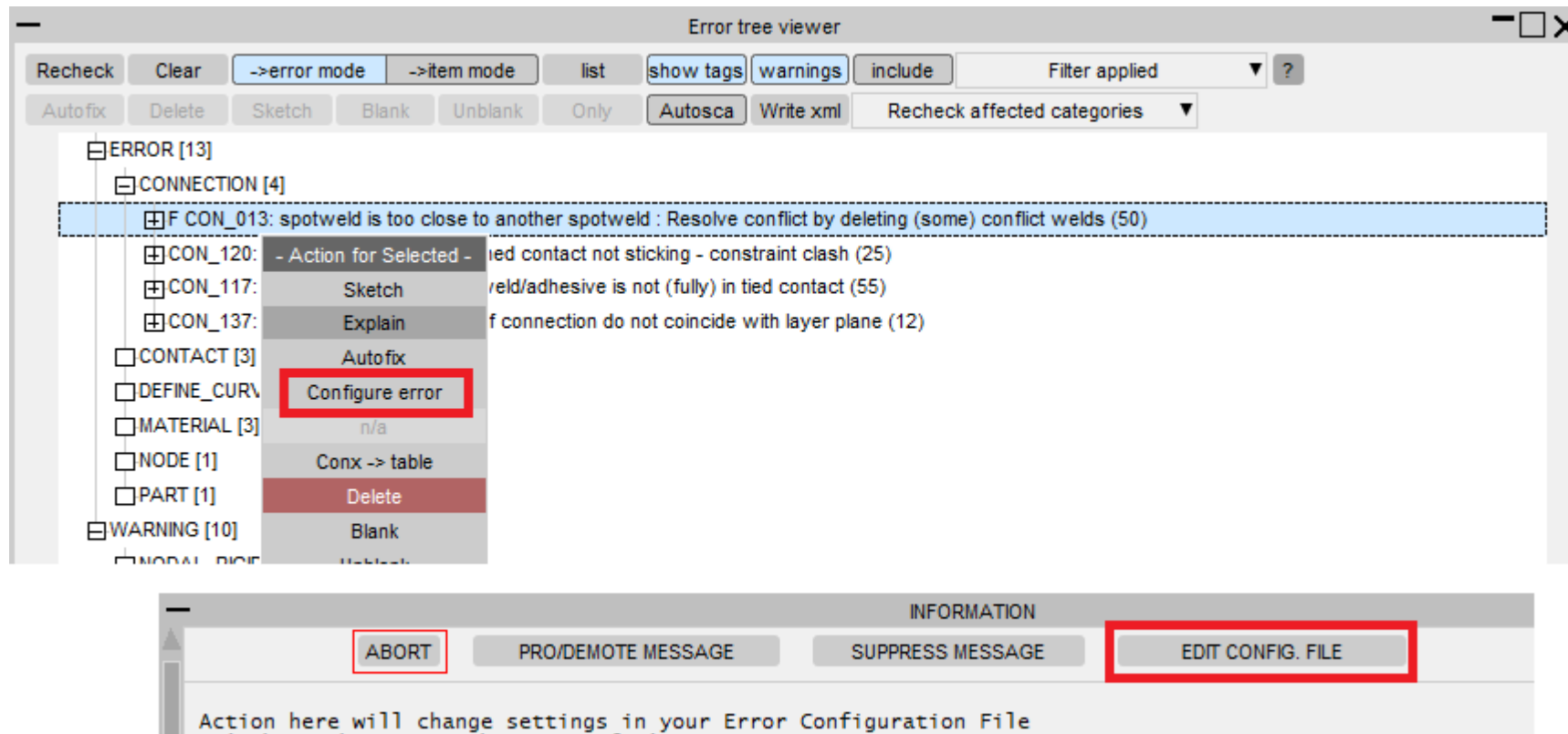
Filtering of errors and warnings by category

- In the error tree viewer a new drop down allows filtering of errors and warnings by category.
- Categories are defined in the preference: **primer*check_tree_category_list**
- This functionality can help make model setup more efficient:
 - Errors or warnings you are not interested in can be hidden.
 - Display only those belonging to certain categories, e.g. those deemed important for the current study.



Filtering of errors and warnings by category

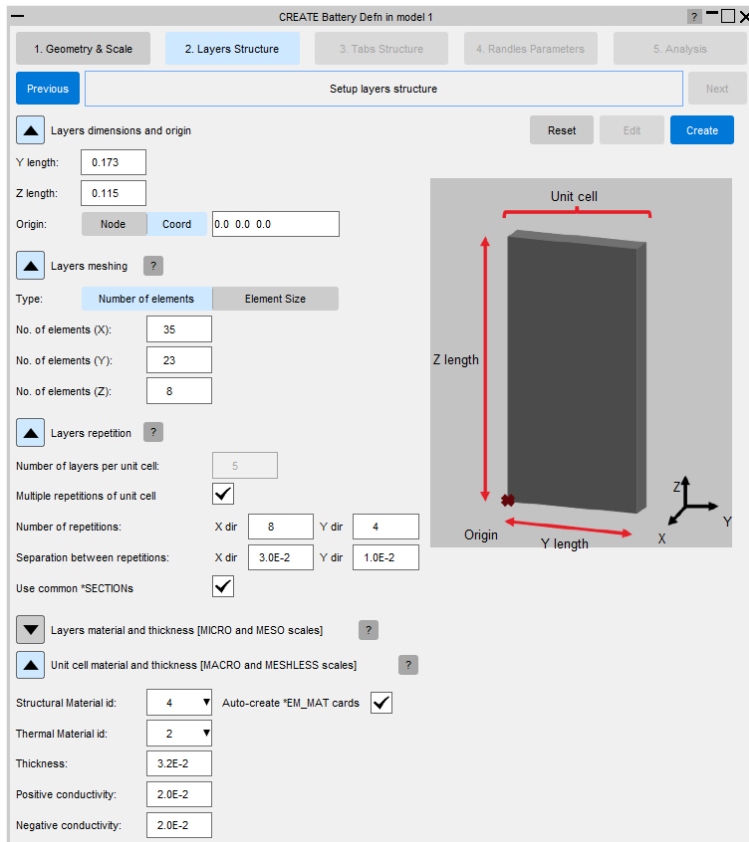
- Any message can be given a category in an **error configuration file**.
- By default this file is found in the home area, but can be changed with preference: **primer*error_configuration_file**
- Can be edited manually, or from tree viewer by right-clicking on any message.



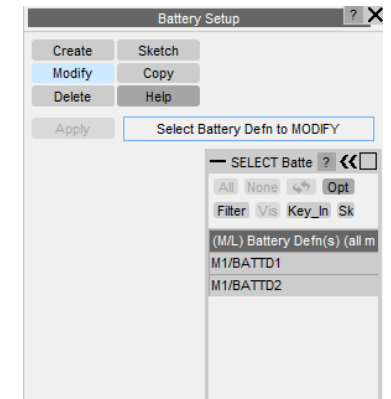
Battery Setup Tool Enhancements

Saving battery definition attributes at file level

- The attributes of a battery definition can now be saved in the model keywords file after the ***END** card. This allows the creation of multiple battery definitions within a model, as well as the ability to modify, delete, copy, orient and sketch an existing definition.

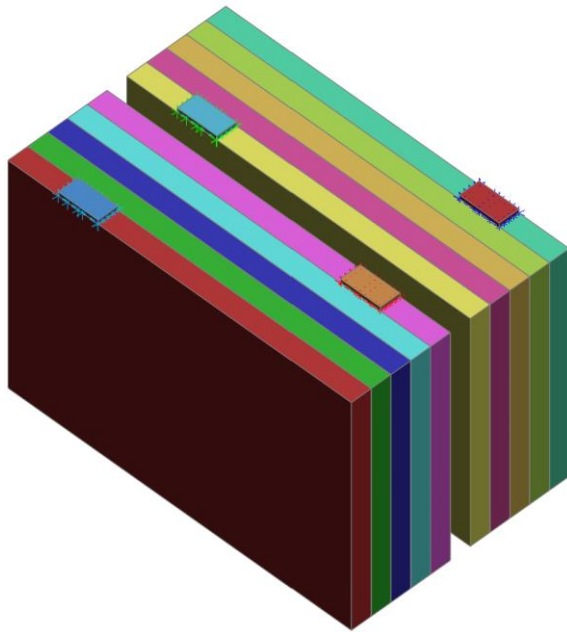


```
*END
$
$
$ =====
$ BATTERY data
$ =====
$
$
*BATT_CELL_START
    1Battery definition 1
      1      2      0      1
$
*BATT_CELL_LAYER
      1      1      0.173      0.115      1      0.0      0.0      0.0
      1      0      35      23      8
      2      1      5      8      0.03      1      1
      4      0.01
      1      4      2      0.032      0.02      0.02
$
*BATT_CELL_TAB
      1      1      0      0.0201      0.002      0.082      0      0
      1      0      4      2      8      1
      1      2      1      0.0      3      1      0.0
      1      1      1      0      0      0.0
$
*BATT_CELL_RANDLES
      1      1      2      2.6      100.0      0.02777      0      3.6
```

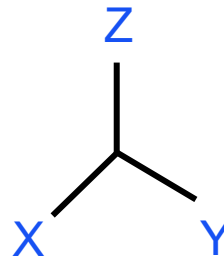


Initial orientation of the battery cell

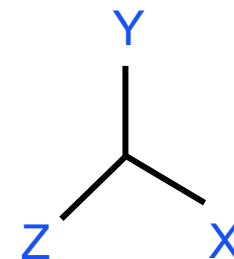
- The orientation of the battery cell created through the 'Battery Setup' tool has been changed to something more sensible. The battery cell can then be oriented freely using the PRIMER 'Orient' tool and selecting the battery definition from the object menu.



New orientation



Old orientation



Creation of ***EM_MAT**

- Added the option to turn off the auto-creation of ***EM_MAT** cards in the '2. Layers structure' panel.
- This applies to both layers and tabs parts.

▲ Layers material and thickness [MICRO and MESO scales] ?

PCC Cathode Separator Anode NCC

Structural Material id: 1 ▼ Auto-create *EM_MAT cards ☒

Thermal Material id: 1 ▼

Thickness: 1.0E-2

Initial conductivity: 0.0

▲ Unit cell material and thickness [MACRO and MESHLESS scales] ?

Structural Material id: 1 ▼ Auto-create *EM_MAT cards ☒

Thermal Material id: 1 ▼

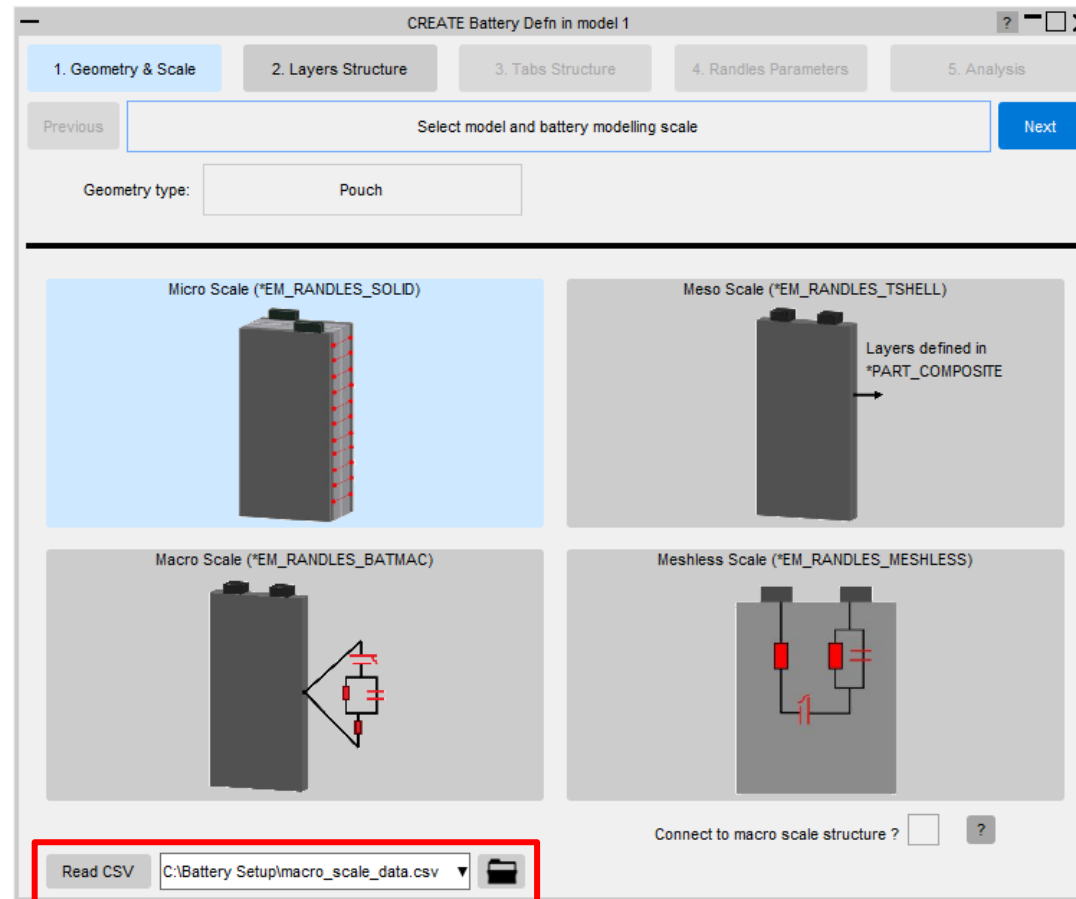
Thickness: 3.2E-2

Positive conductivity: 0.0

Negative conductivity: 0.0

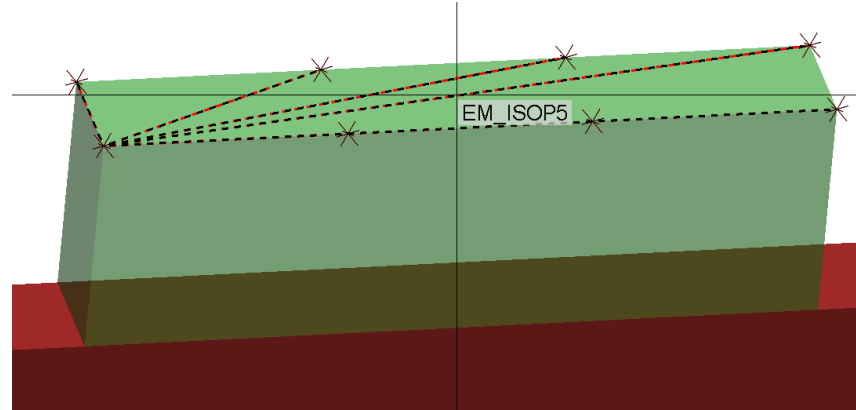
Read CSV

- Improved the file selection for importing CSV data in the startup panel.
- The file can be selected by either entering the path in the textbox or using the file selector. Then clicking on 'Read CSV' imports the data.

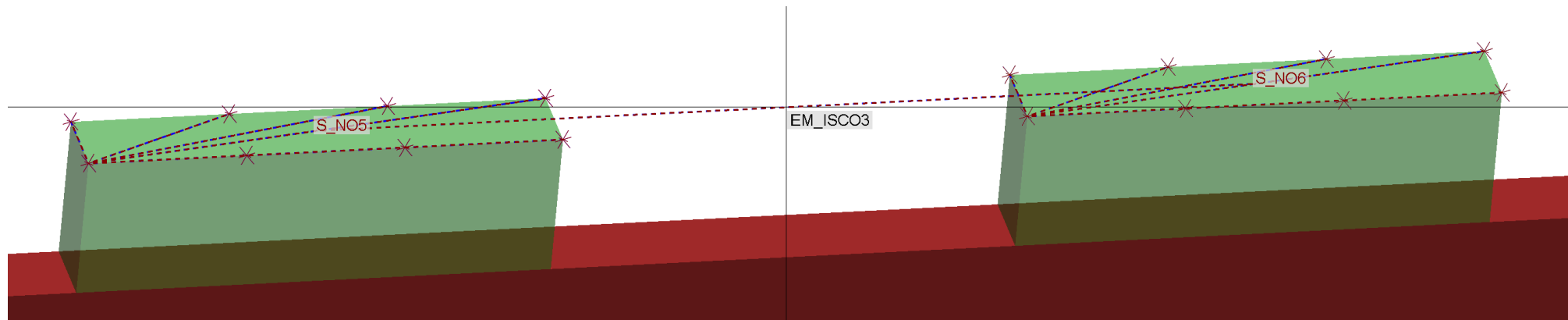


***EM_ISOPOTENTIAL and *EM_ISOPOTENTIAL_CONNECT**

- Added drawing and picking functionalities for ***EM_ISOPOTENTIAL** and modified sketching to connect composite nodes by lines.

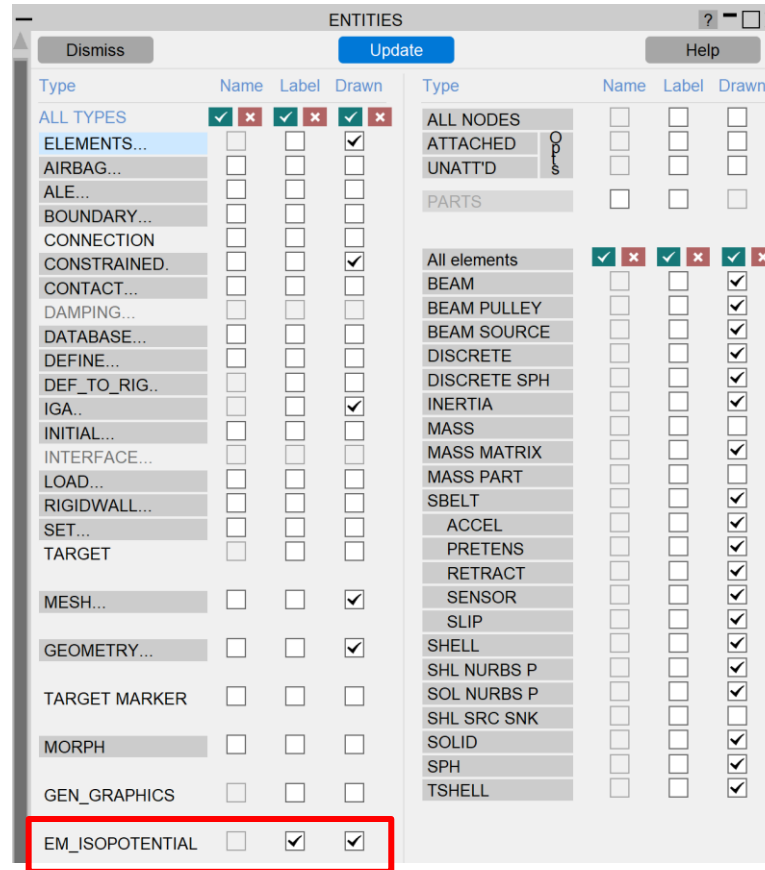


- Added drawing, sketching and picking functionalities for ***EM_ISOPOTENTIAL_CONNECT**.



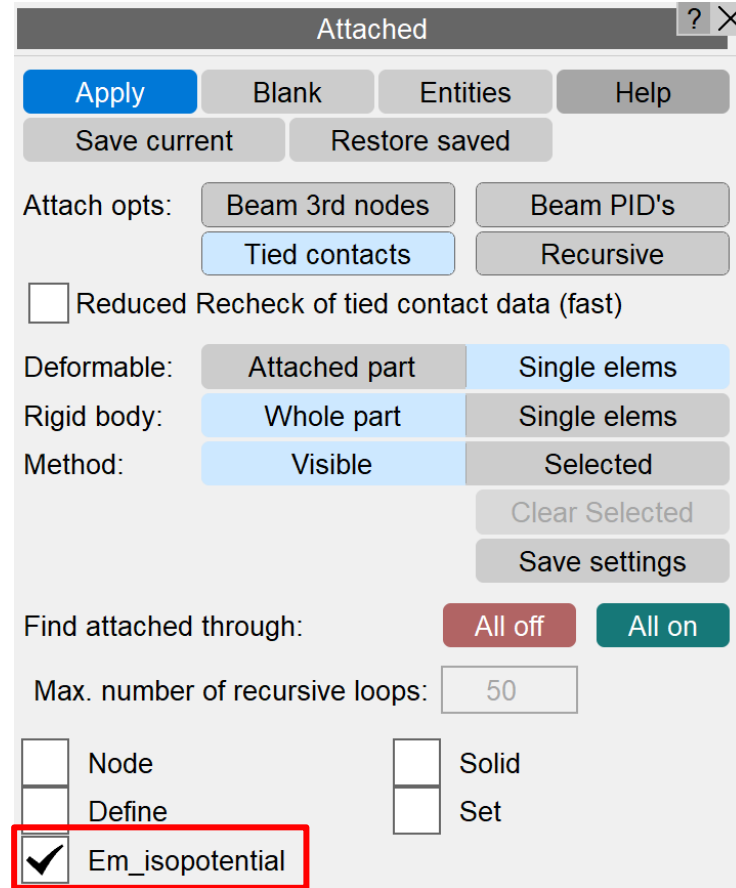
*EM_ISOPOTENTIAL and *EM_ISOPOTENTIAL_CONNECT

- Added a new entry in the ENTITIES panel that controls the drawing and labelling of *EM_ISOPOTENTIAL and *EM_ISOPOTENTIAL_CONNECT.



*EM_ISOPOTENTIAL and *EM_ISOPOTENTIAL_CONNECT

- Added *EM_ISOPOTENTIAL to the list of 'find attached through' types within the Attached tool.

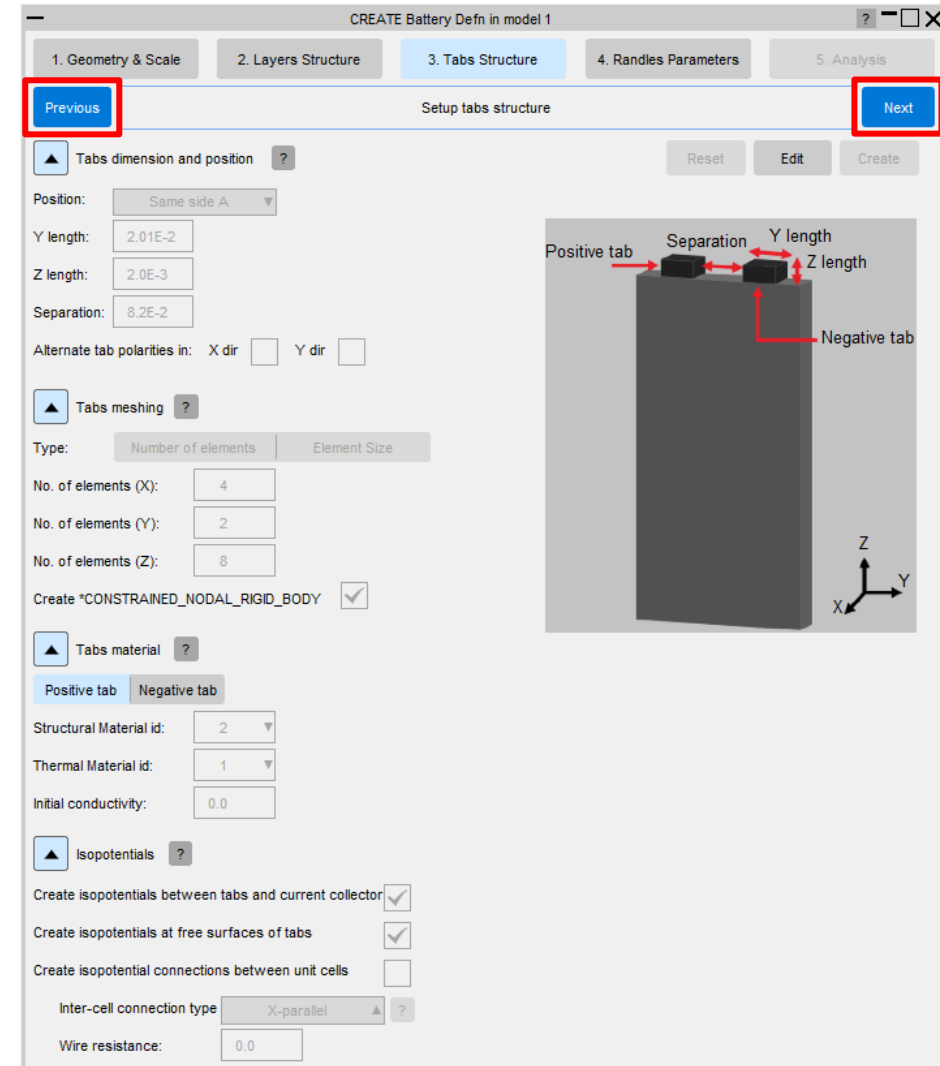


The screenshot shows the 'Attached' dialog box with the following settings:

- Buttons:** Apply, Blank, Entities, Help, Save current, Restore saved.
- Attach opts:** Beam 3rd nodes, Beam PID's, Tied contacts (selected), Recursive.
- Reduced Recheck of tied contact data (fast):** ☐
- Deformable:** Attached part, Single elems (selected).
- Rigid body:** Whole part, Single elems.
- Method:** Visible (selected), Selected.
- Buttons:** Clear Selected, Save settings.
- Find attached through:** All off, All on (selected).
- Max. number of recursive loops:** 50.
- Find attached through types:**
 - ☐ Node
 - ☐ Define
 - ☒ Em_isopotential (highlighted with a red box)
 - ☐ Solid
 - ☐ Set

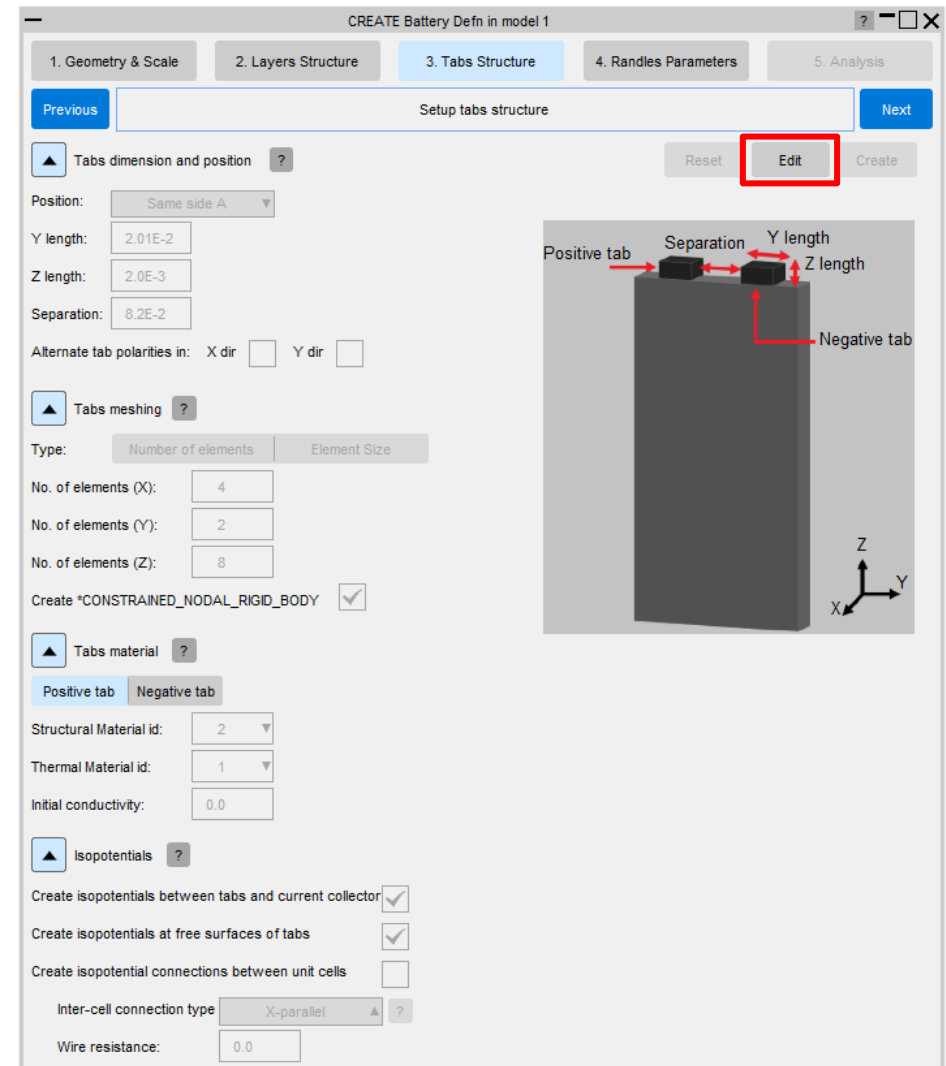
Ability to go back to previous steps and edit

- Added the option to move between different steps using either the newly added **Previous** and **Next** buttons or the tabs at the top.
- The tool will no longer automatically jump to the next step when clicking on **Create** as before but it will remain at the current panel to give the chance to check the settings and make any modifications if needed before proceeding to the next step.



Ability to go back to previous steps and edit

- Added the option to undo creation of 'Layers structure', 'Tabs structure' and 'Randles parameters' using the **Edit** button.



Ability to go back to previous steps and edit

- Added the option to make modifications in the '5. Analysis' panel after clicking on **Apply**.
- The **Apply** button will get reactivated if any of the parameters in the panel get updated.

CREATE Battery Defn in model 1

1. Geometry & Scale 2. Layers Structure 3. Tabs Structure 4. Randles Parameters 5. Analysis

Previous Define analysis parameters Next

Structural analysis

*CONTROL_SOLUTION ☒ Analysis type: Combined

*CONTROL_TERMINATION ☒ Termination time: 3600.0

*CONTROL_TIMESTEP ☒ Initial time step: 5.0

Write CSV **Apply** Reset Done

Create Battery

Thermal analysis

*CONTROL_THERMAL_TIMESTEP ☒ Time step: 10.0

*CONTROL_THERMAL_SOLVER ☒ Analysis type: Transient Problem type: Non-Linear (gauss)

EM analysis

*EM_CONTROL ☒ EM cycles for FEM: 10 EM cycles for BEM: 5000

*EM_CONTROL_TIMESTEP ☒ Time step: 5.0

*EM_OUTPUT ☒ Level of matrix assembly output: No output Level of solver output: No output

*EM_RANDLES_EXOTHERMIC_REACTION ☐ Heat source area type: Per unit area Function:

*EM_RANDLES_SHORT ☐ Resistance area type: Per unit area Function:

Ability to go back to previous steps and edit

- Added the option to reset all the parameters to their defaults at any stage.

The screenshot shows a software interface for defining battery parameters. The title bar reads "CREATE Battery Defn in model 1". There are five tabs: "1. Geometry & Scale", "2. Layers Structure", "3. Tabs Structure", "4. Randles Parameters", and "5. Analysis". The "5. Analysis" tab is active. Below the tabs, there are navigation buttons: "Previous", "Define analysis parameters", and "Next". The main area is divided into three sections: "Structural analysis", "Thermal analysis", and "EM analysis". Each section has several checkboxes and input fields. In the "Structural analysis" section, the "Reset" button is highlighted with a red rectangle. Other buttons include "Write CSV", "Apply", "Done", and "Create Battery".

Structural analysis

- *CONTROL_SOLUTION ☒ Analysis type: Combined
- *CONTROL_TERMINATION ☒ Termination time: 3600.0
- *CONTROL_TIMESTEP ☒ Initial time step: 5.0

Thermal analysis

- *CONTROL_THERMAL_TIMESTEP ☒ Time step: 10.0
- *CONTROL_THERMAL_SOLVER ☒ Analysis type: Transient Problem type: Non-Linear (gauss)

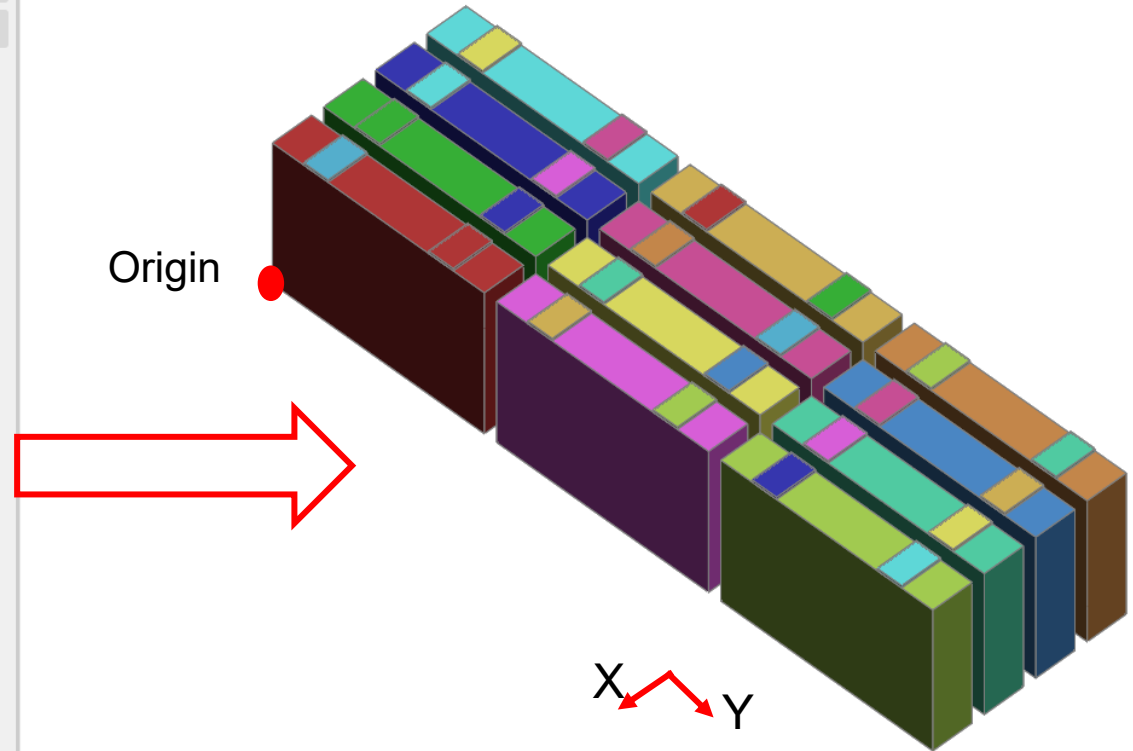
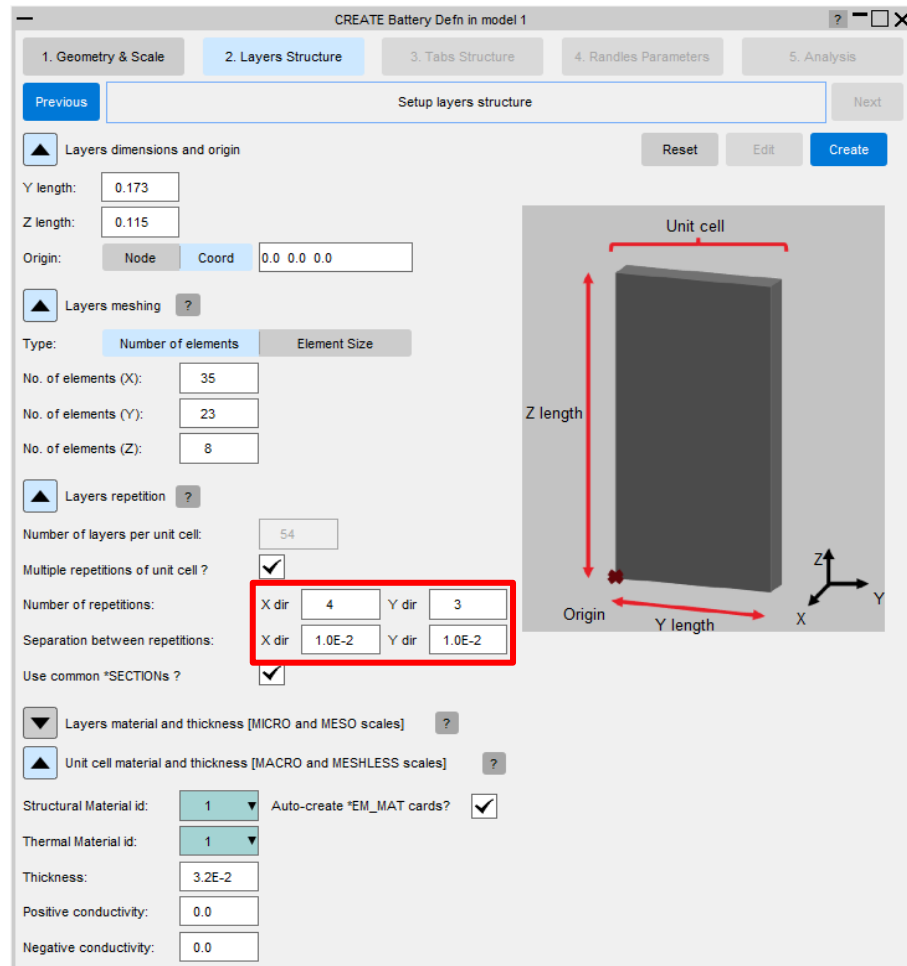
EM analysis

- *EM_CONTROL ☒ EM cycles for FEM: 10 EM cycles for BEM: 5000
- *EM_CONTROL_TIMESTEP ☒ Time step: 5.0
- *EM_OUTPUT ☒ Level of matrix assembly output: No output Level of solver output: No output
- *EM_RANDLES_EXOTHERMIC_REACTION ☐ Heat source area type: Per unit area Function:
- *EM_RANDLES_SHORT ☐ Resistance area type: Per unit area Function:

Buttons: Write CSV, Apply, Reset, Done, Create Battery

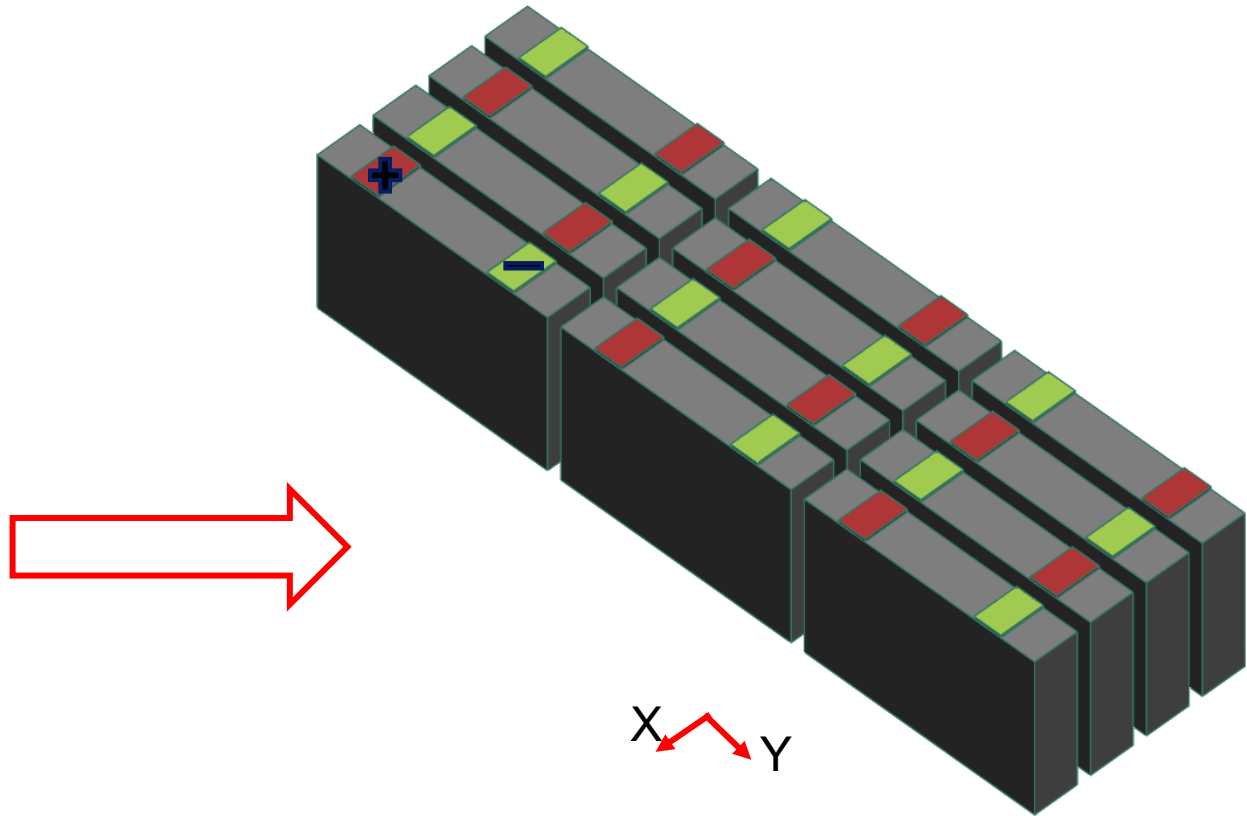
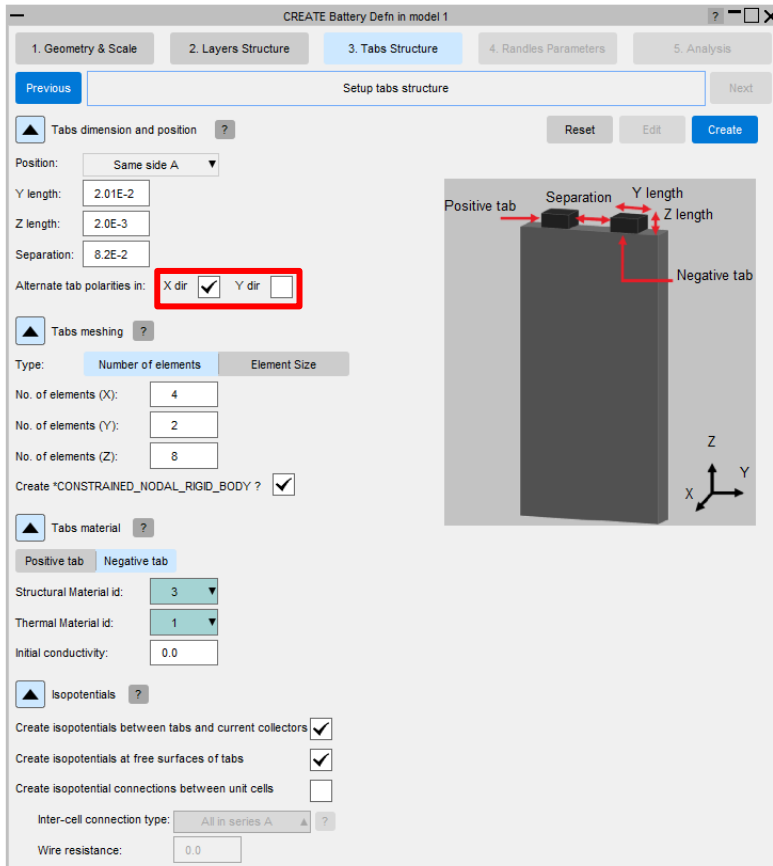
Creating an array of unit cells

- Added the option to create an array of unit cells under the same battery definition by setting any number of unit cell repetitions in both x and y directions.



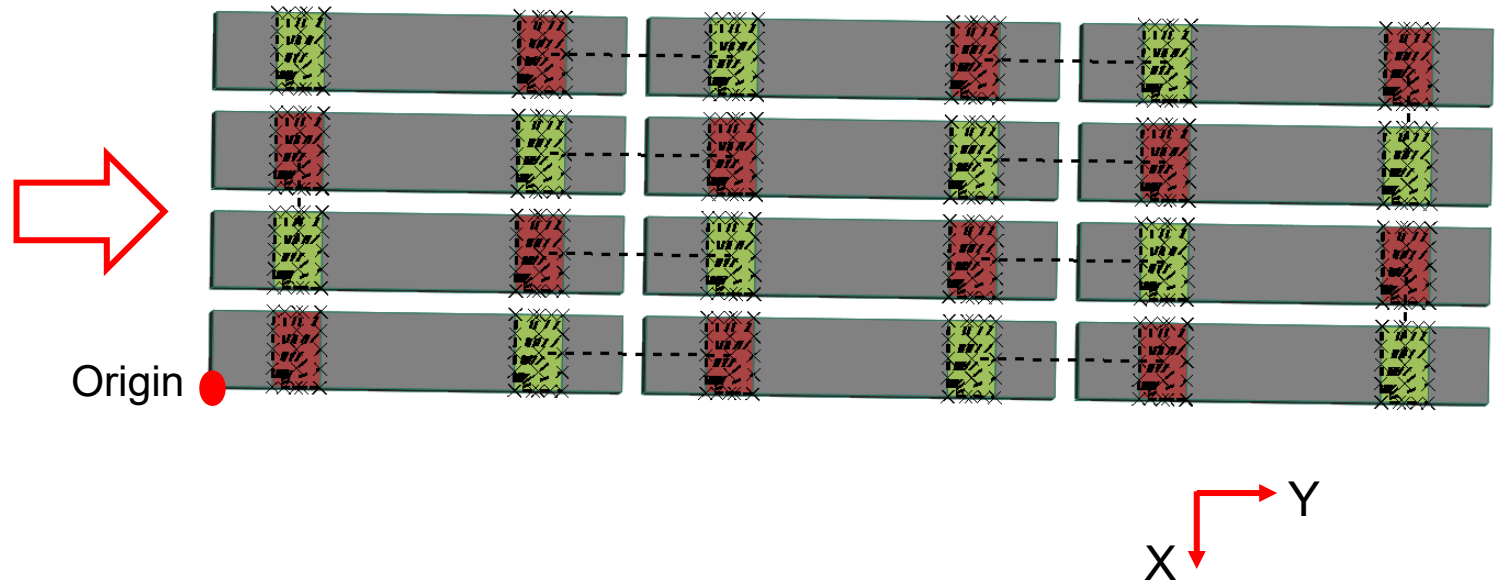
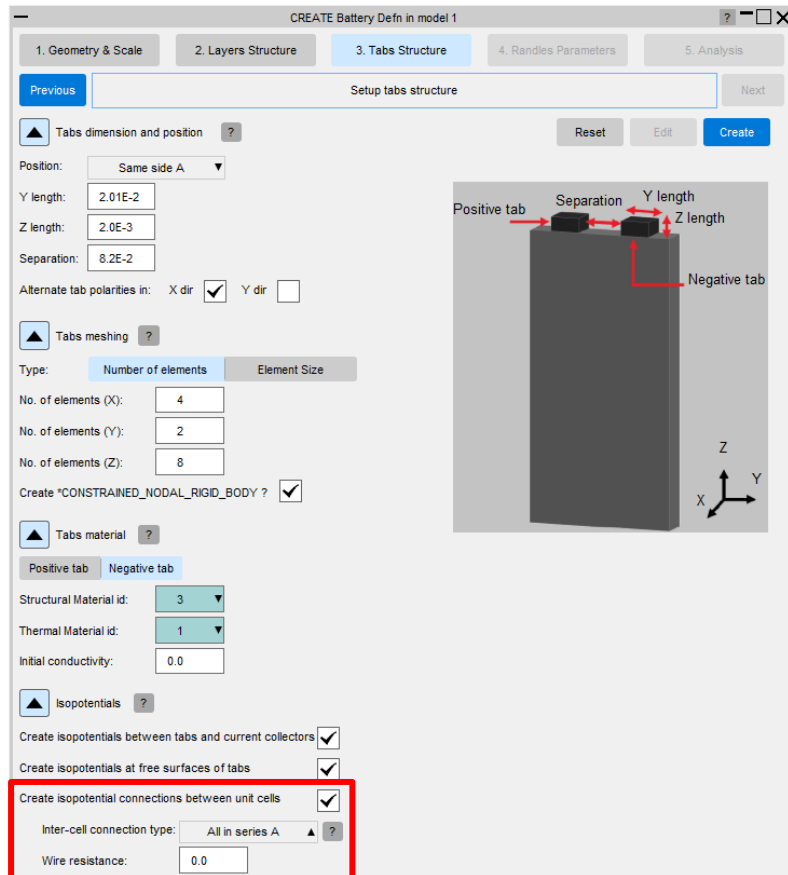
Alternating tab polarities

- Added the option to alternate the tab polarities every other cell in x and/or y directions. This is reflected in the titles provided to the tabs parts, the position of tabs if in 'micro scale' mode, and the isopotential connections configuration between unit cells.



Isopotential connections between unit cells

- Added the option to auto-create ***EM_ISOPOTENTIAL_CONNECT**s that model the electrical connections between unit cells. This can be done based on a range of possible configurations. The options offered depend on the selected tabs positions and relative polarities.

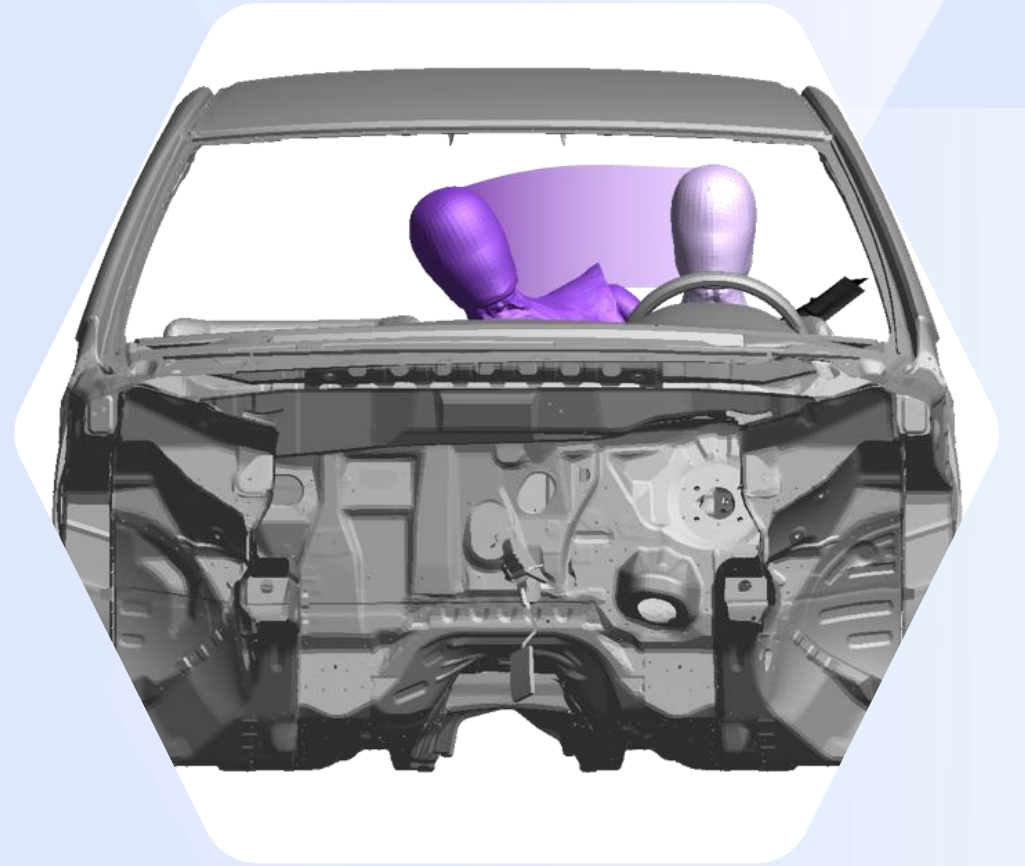


Efficient End-to-End Workflows

Virtual Testing

- [C-NCAP Management Regulation](#)
- [Euro NCAP 2026 Protocols](#)
- [Working with Test Data](#)
- [LS-DYNA to ISO-MME Improvements](#)
- [Automotive Assessments Improvements](#)
- [SimVT](#)
- [VTC Quality Criteria Workflows](#)
- [VTC Videos Workflows](#)

C-NCAP Management Regulation

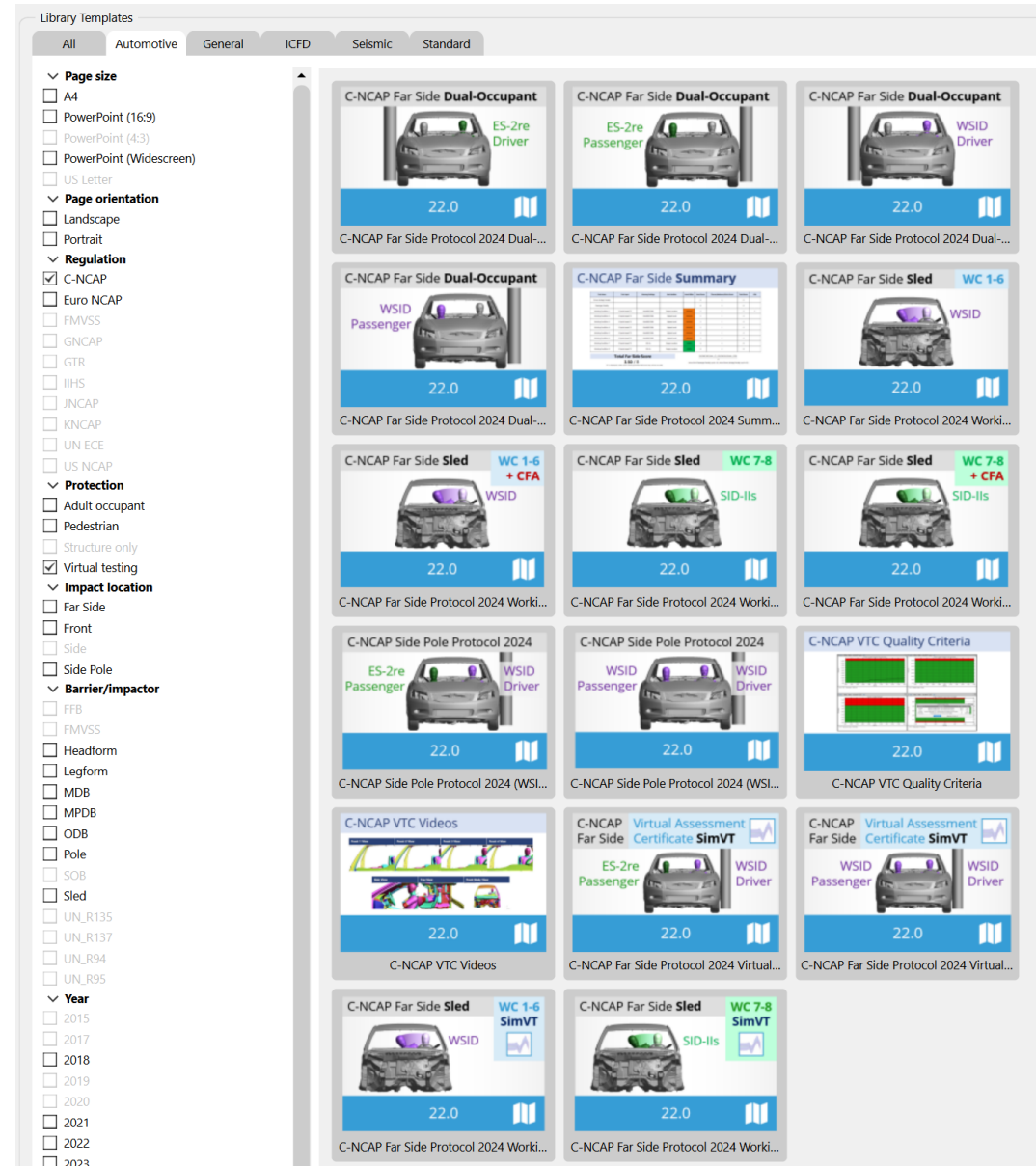


C-NCAP Management Regulation (2024 Edition)

Since Oasys 21.1, there has been support for the various requirements of the C-NCAP Far Side Occupant Protection Protocol, including:

- For each of the eight Working Conditions:
 - Occupant injury assessment
 - ISO Correlation Fitting indices
 - Correction Factor A
- Dual-Occupant Penalty calculation
- ISO correlation fitting indices for the Virtual Assessment Certificate (prerequisite for the symmetry of far side occupant protection airbags)
- Overall score calculation

[Read the documentation to learn more](#)

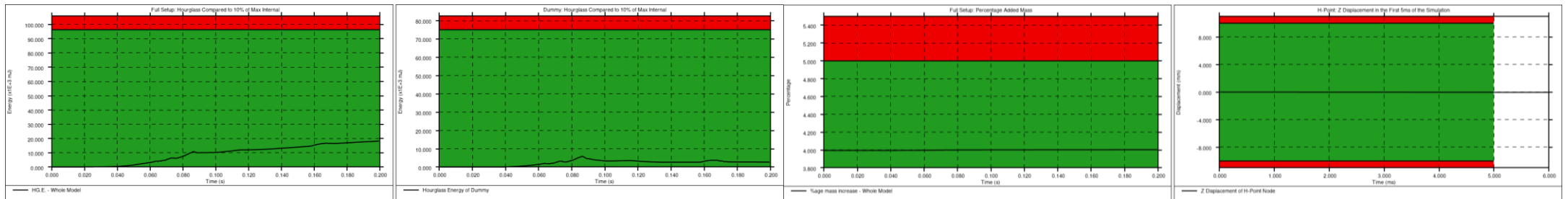


C-NCAP VTC Quality Criteria

- The C-NCAP VTC Quality Criteria Workflow tool follows the same principals as the Euro NCAP version but assesses the quality criteria specified in section H.1.1(f) of the C-NCAP Far Side Simulation & Assessment Protocol.
- The tool can be automated using the REPORTER template provided.

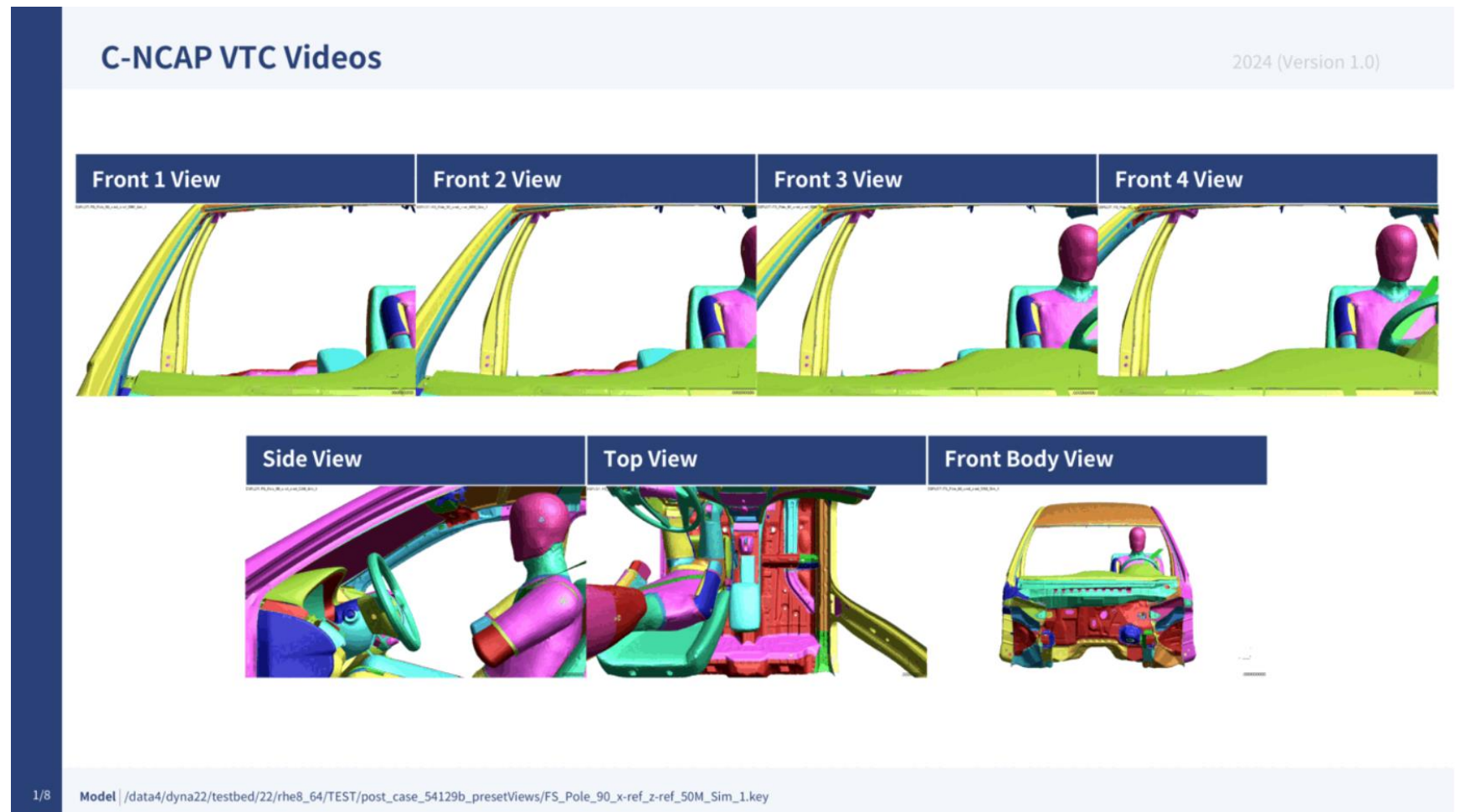
C-NCAP VTC Quality Criteria				
Component	Test Description	Limit	Result	
Full Setup	Maximum Hourglass Energy < 10% of Maximum Internal Energy	96312	18243	✓
Dummy	Maximum Hourglass Energy < 10% of Maximum Internal Energy	75128	5834.5	✓
Full Setup	Maximum Added Mass (%) < Total Model Mass at the Beginning of the Simulation	5	4.0043	✓
H-Point Node	Z Displacement (mm) in the First 5ms of the Simulation	10	0.00085449	✓

Write Results Model Units: U2 (mm, t, s)



C-NCAP VTC Videos

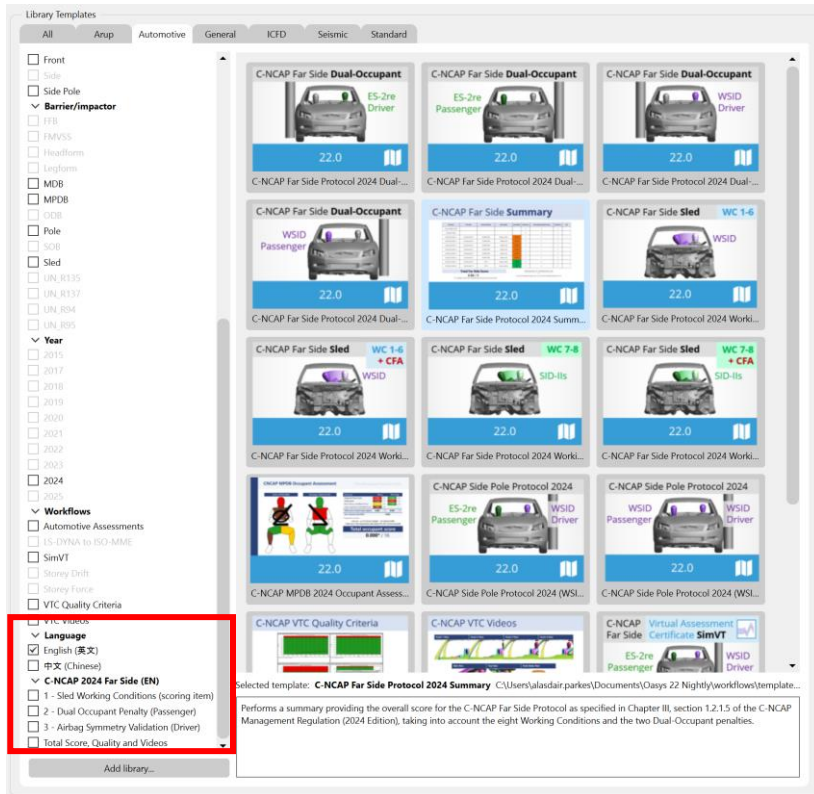
- The **C-NCAP VTC Videos** Workflow tool follows the same principles as the Euro NCAP version but helps you calculate the views and export the videos specified in section H.2.8 of the C-NCAP Far Side Occupant Protection Protocol (2024 Edition).
- Use the standard Workflow method in **PRIMER** and **D3PLOT** or the whole process can be automated using the **REPORTER** template provided.



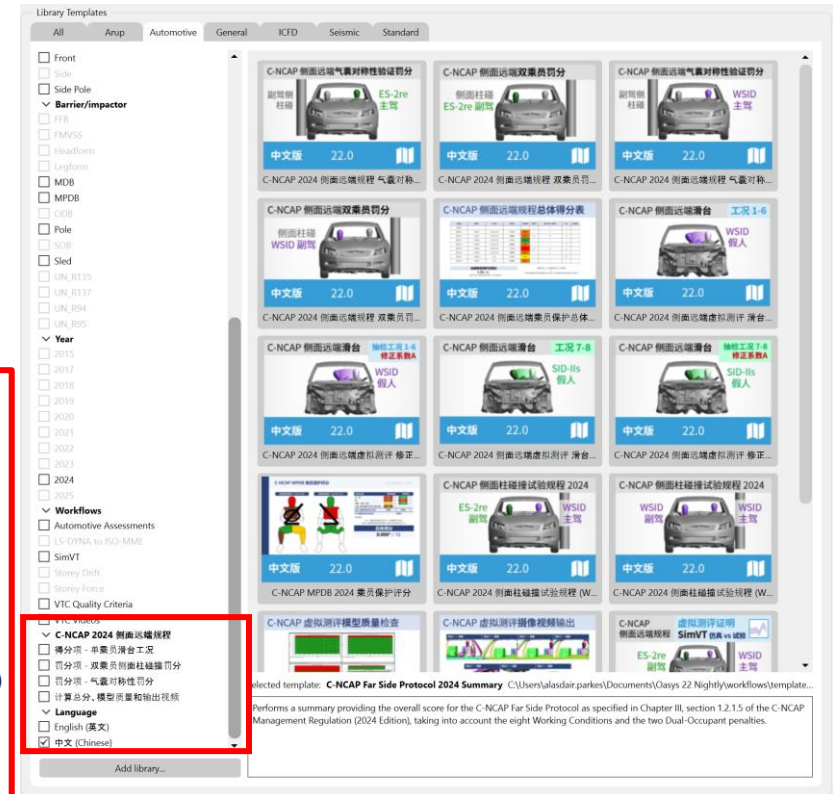
Chinese Language Reports

中文版报告模板

- You now have access to all the C-NCAP REPORTER templates in both English and Chinese, for ease of communication with your teams, partners, suppliers, and C-NCAP.
- 所有 C-NCAP REPORTER 模板都同时提供英文和中文版供您使用，方便您与团队、合作伙伴、供应商，和 C-NCAP 沟通。



- ▼ **C-NCAP 2024 侧面远端规程**
- ☐ 得分项 - 单乘员滑台工况
- ☐ 罚分项 - 双乘员侧面柱碰撞罚分
- ☐ 罚分项 - 气囊对称性罚分
- ☐ 计算总分、模型质量和输出视频
- ▼ **Language**
- ☒ English (英文)
- ☒ 中文 (Chinese)
- ▼ **C-NCAP 2024 Far Side (EN)**
- ☐ 1 - Sled Working Conditions (scoring item)
- ☐ 2 - Dual Occupant Penalty (Passenger)
- ☐ 3 - Airbag Symmetry Validation (Driver)
- ☐ Total Score, Quality and Videos



Chinese Language Reports

中文版报告模板

- Example reports generated by C-NCAP REPORTER templates, in English (left) and Chinese (right):
- 下方展示了由 C-NCAP REPORTER 模板自动生成的英文版（左侧）和中文版（右侧）报告示例。

C-NCAP Far Side Protocol 2024 Working Conditions 7-8 SimVT

Head acceleration									
Item	Protocol	Test	Condition	Result	Pass	Weight	Value	Score	Pass
H1	114-00000000-01	TS	1	1	1	1	1.0	0.00	1
H2	114-00000000-02	TS	1	1	1	1	1.0	0.00	1
H3	114-00000000-03	TS	1	1	1	1	1.0	0.00	1

Sensor Score > 0.7 (PASS)

C-NCAP Far Side 2024 Working Condition 1 with Correction Factor A

Head excursion

Region	Component	Unit	Result	Pass	Weight	Value	Score	Pass
Head	Head excursion	mm	1.0	1	1	1.0	0.00	1
Upper (mm)	Upper (mm)	mm	1.0	1	1	1.0	0.00	1
Lower (mm)	Lower (mm)	mm	1.0	1	1	1.0	0.00	1
Abdomen Compression	Abdomen Compression	mm	1.0	1	1	1.0	0.00	1

Total Score for Working Condition 1

CFA	Sim	Test
1	2/8	2/8

C-NCAP Far Side 2024 Dual-Occupant Penalty (WSID Passenger)

Region	Component	Unit	Result	Pass	Value
Head	HIC	700	Pass	40.183	
Thorax	Compression Deformation (mm)	90	Pass	25.744	
Abdomen	Viscous Criterion (m/s)	1.0	Pass	0.005	
Abdomen	Compression Deformation (mm)	45	Pass	0.132	
Abdomen	Viscous Criterion (m/s)	1.0	Pass	0.015	
Abdomen	Public Force (kN)	2.8	Pass	0.276	

Total Penalty

0

C-NCAP Far Side Protocol 2024 Summary

Test Name	Test Report	Summary Settings	Test Results	Pass/Fail	Weight	Value	Score	Pass
Head	Head	Head	Head	Pass	1	1.0	0.00	1
Upper (mm)	Upper (mm)	Upper (mm)	Upper (mm)	Pass	1	1.0	0.00	1
Lower (mm)	Lower (mm)	Lower (mm)	Lower (mm)	Pass	1	1.0	0.00	1
Abdomen Compression	Abdomen Compression	Abdomen Compression	Abdomen Compression	Pass	1	1.0	0.00	1

Total Far Side Score

3.50 / 8

C-NCAP 2024 侧面远端虚拟测评 滑台工况 7 - 8 相关性对标项 (SID-IIa)

Item	Protocol	Test	Condition	Result	Pass	Weight	Value	Score	Pass
H1	114-00000000-01	TS	1	1	1	1	1.0	0.00	1
H2	114-00000000-02	TS	1	1	1	1	1.0	0.00	1
H3	114-00000000-03	TS	1	1	1	1	1.0	0.00	1

传感器得分 > 0.7 (通过)

C-NCAP 2024 侧面远端虚拟测评 修正系数 A (抽检滑台工况 1, WSID)

Head excursion

Region	Component	Unit	Result	Pass	Weight	Value	Score	Pass
Head	Head excursion	mm	1.0	1	1	1.0	0.00	1
Upper (mm)	Upper (mm)	mm	1.0	1	1	1.0	0.00	1
Lower (mm)	Lower (mm)	mm	1.0	1	1	1.0	0.00	1
Abdomen Compression	Abdomen Compression	mm	1.0	1	1	1.0	0.00	1

Total Score for Working Condition 1

CFA	Sim	Test
1	2/8	2/8

C-NCAP 2024 侧面远端虚拟测评 双乘员得分 (侧面碰撞, WSID 驾驶员)

Item	Protocol	Test	Condition	Result	Pass	Weight	Value	Score	Pass
H1	114-00000000-01	TS	1	1	1	1	1.0	0.00	1
H2	114-00000000-02	TS	1	1	1	1	1.0	0.00	1
H3	114-00000000-03	TS	1	1	1	1	1.0	0.00	1

传感器得分 > 0.7 (通过)

C-NCAP 2024 侧面远端虚拟测评 气震对称性虚拟测评 (侧面碰撞, WSID 主驾, WSID 副驾)

Item	Protocol	Test	Condition	Result	Pass	Weight	Value	Score	Pass
H1	114-00000000-01	TS	1	1	1	1	1.0	0.00	1
H2	114-00000000-02	TS	1	1	1	1	1.0	0.00	1
H3	114-00000000-03	TS	1	1	1	1	1.0	0.00	1

传感器得分 > 0.7 (通过)

C-NCAP 2024 侧面远端虚拟测评 气震对称性验证 (副驾侧碰撞, ES-2re 主驾)

Item	Protocol	Test	Condition	Result	Pass	Weight	Value	Score	Pass
H1	114-00000000-01	TS	1	1	1	1	1.0	0.00	1
H2	114-00000000-02	TS	1	1	1	1	1.0	0.00	1
H3	114-00000000-03	TS	1	1	1	1	1.0	0.00	1

传感器得分 > 0.7 (通过)

C-NCAP 2024 侧面远端乘员保护总体得分表

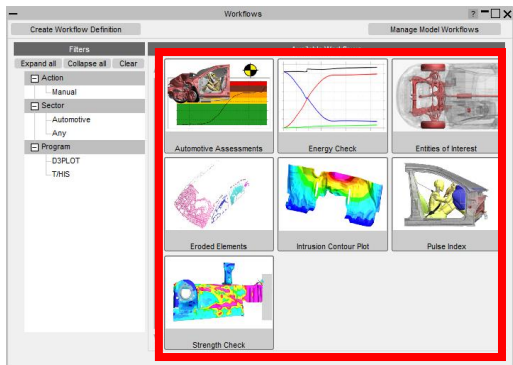
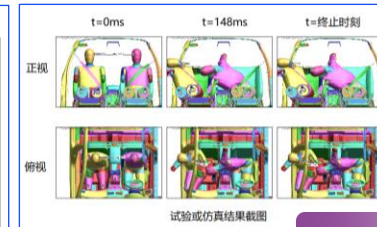
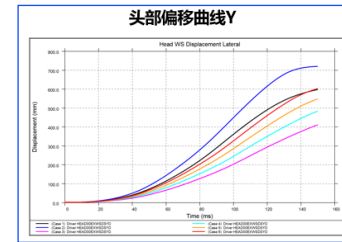
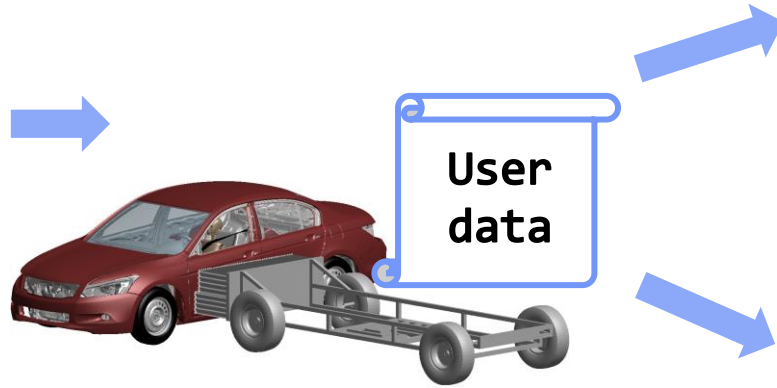
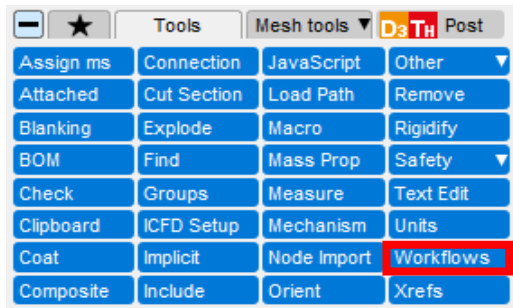
Item	Protocol	Test	Condition	Result	Pass	Weight	Value	Score	Pass
H1	114-00000000-01	TS	1	1	1	1	1.0	0.00	1
H2	114-00000000-02	TS	1	1	1	1	1.0	0.00	1
H3	114-00000000-03	TS	1	1	1	1	1.0	0.00	1

传感器得分 > 0.7 (通过)

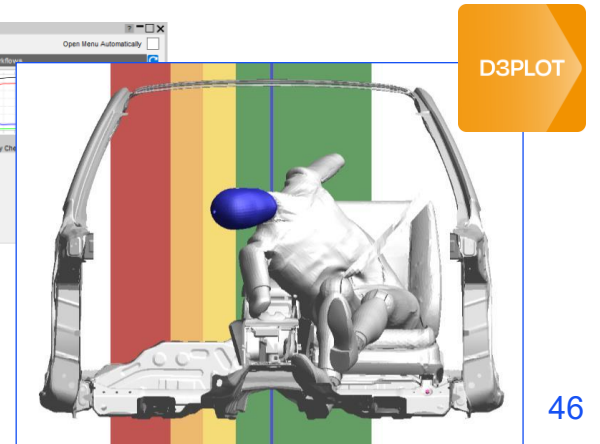
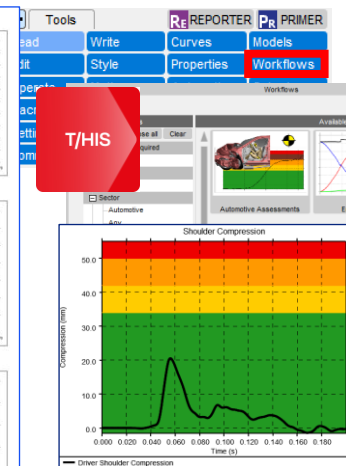
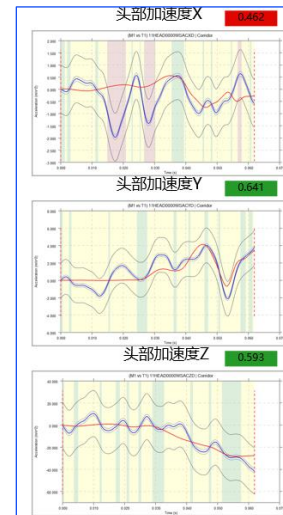
C-NCAP Far Side 2024 Official Format Template (inc. O2O)

- The C-NCAP Far Side 2024 protocol (including Occupant to Occupant Assessment) can now be produced in the official format template as requested by C-NCAP. Set up your models in PRIMER, tag with user data using Workflows, and run the REPORTER Templates. Alternatively, outputs can be viewed interactively in D3PLOT and T/HIS. Full instructions in Chinese can be found in our documentation under Workflows.

序号	工况	假人	座椅位置	头部偏移量	头部得分	胸部得分	合计
工况1*	32柱碰*75°	WS50	设计位置	黄色区	4	4	8
工况2	32柱碰*75°	WS50	座椅位置: 最高	橙色区	3	3	6
工况3	32柱碰*90°	WS50	设计位置	绿色区	4	4	8
工况4*	32柱碰*90°	WS50	座椅位置: 最高	绿色区	4	4	8
工况5	32柱碰*60°	WS50	设计位置	黄色区	4	4	8
工况6*	32柱碰*60°	WS50	座椅位置: 最高	黄色区	4	4	8
工况7	32柱碰*75°	sid2s	设计位置	橙色区	3	3	6
工况8*	32柱碰*75°	sid2s	最高	橙色区	3	3	6
合计总分							58,000
换算分(占乘员保护)							7,250



- CASE_1
- CASE_2
- CASE_3
- CASE_4
- CASE_5
- CASE_6
- aa_CNCAP_FAR_SIDE_VTC_WSID.json



- Below shows a preview of the automatically generated contents for C-NCAP 2024 Far Side VTC report.



C-NCAP Far Side 2024 Official Format Template (inc. O2O)

- Below shows a preview of the automatically generated contents for C-NCAP 2024 O2O report.

REPORTER

Far side气囊保护效果一致性证明报告

【左侧柱碰，WSID + ES2RE】

提交日期
提交单位
提交人
提交人联系方式

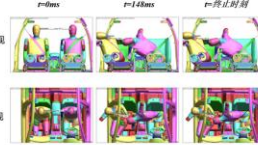
X年X月X日
XXX
XXX
XXXXXXXXXX



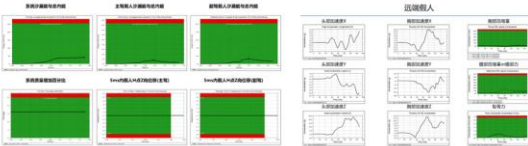


1/5

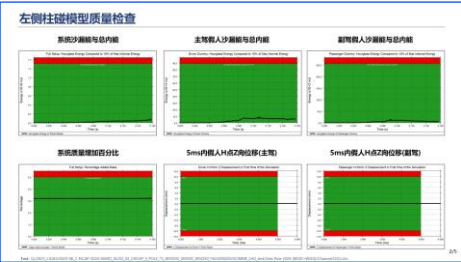
右侧柱碰 (WSID+WSID)



碰撞速度	碰撞高度	碰撞角度
100 km/h	1.5m	0°
100 km/h	1.5m	15°
100 km/h	1.5m	30°
100 km/h	1.5m	45°
100 km/h	1.5m	60°
100 km/h	1.5m	75°
100 km/h	1.5m	90°



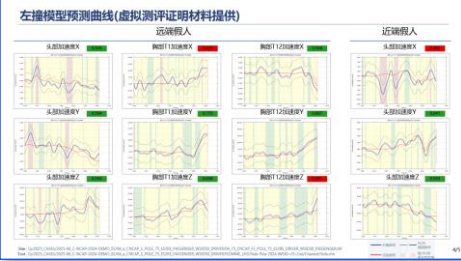
2/5



左侧柱碰模型质量检查

项目	判定标准	数值	限值	结果
系统沙漏率	最大沙漏率≤1%且总内能≤10%	0.0005	1.00E-06	Pass
主驾侧人沙漏率	最大沙漏率≤1%且总内能≤10%	7462.3	89141	Pass
副驾侧人沙漏率	最大沙漏率≤1%且总内能≤10%	1151.2	2.25E+05	Pass
系统质量增加	最大质量增加≤5% (含) 且沙漏率≤1%且总内能≤10%	3.19E3	5	Pass
主驾H点Z轴位移	在碰撞前最后时刻Z轴位移≤5mm	0.035889	±10	Pass
副驾H点Z轴位移	在碰撞前最后时刻Z轴位移≤5mm	0.035889	±10	Pass

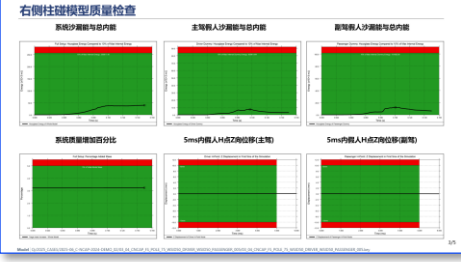
1/5



左撞模型预测曲线(虚拟测评证明材料提供)

项目	判定标准	数值	限值	结果
远端假人	最大加速度≤10g	1.00E+01	10	Pass
近端假人	最大加速度≤10g	1.00E+01	10	Pass

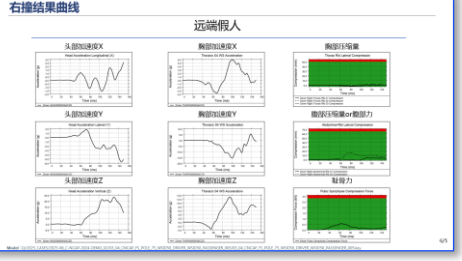
1/5



右侧柱碰模型质量检查

项目	判定标准	数值	限值	结果
系统沙漏率	最大沙漏率≤1%且总内能≤10%	0.0005	1.00E-06	Pass
主驾侧人沙漏率	最大沙漏率≤1%且总内能≤10%	7462.2	89141	Pass
副驾侧人沙漏率	最大沙漏率≤1%且总内能≤10%	1151.2	2.25E+05	Pass
系统质量增加	最大质量增加≤5% (含) 且沙漏率≤1%且总内能≤10%	3.19E3	5	Pass
主驾H点Z轴位移	在碰撞前最后时刻Z轴位移≤5mm	0.035889	±10	Pass
副驾H点Z轴位移	在碰撞前最后时刻Z轴位移≤5mm	0.035889	±10	Pass

1/5



C-NCAP Front AEB OOP 2024 Official Format Template

- The C-NCAP Front AEB OOP 2024 protocol can now be produced in the official format template as requested by C-NCAP. Set up your models in PRIMER, tag with user data using Workflows, and run the REPORTER Templates. Alternatively, outputs can be viewed interactively in D3PLOT and T/HIS. Full instructions in Chinese can be found in our documentation under Workflows.

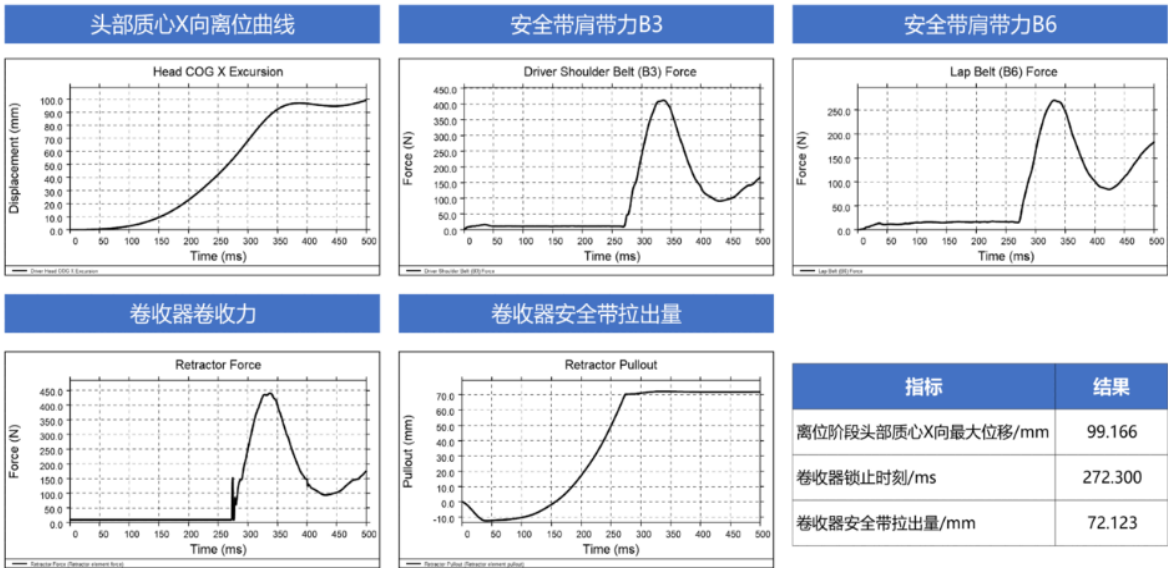
工况OOP+MPDB预测伤害明细

■ 工况OOP+MPDB预测结果统计

	测量部位	测量参数	滤波频率等级CFC	伤害指标计算	OOP+MPDB
驾驶员 THOR 50th 男性假人	头部	加速度Ax、Ay、Az	1000	HIC15合成加速度	27.410
				3ms 合成加速度值(g)	20.801
				脑损伤DAMAGE	0.169
	颈部	力Fx	1000	剪切力 Fx (kN)	1.696
		力Fz		张力 Fz (kN)	0.810
		力矩My	600	伸张弯矩 My (Nm)	-6.259
	胸部	胸部压缩量	180	左上肋骨位移量(mm)	23.387
				左下肋骨位移量(mm)	10.346
				右上肋骨位移量(mm)	33.836
				右下肋骨位移量(mm)	20.621
	腹部	腹部压缩量	180	左侧腹部压缩量(mm)	28.829
				右侧腹部压缩量(mm)	31.657

工况OOP+MPDB乘员伤害结果预测曲线

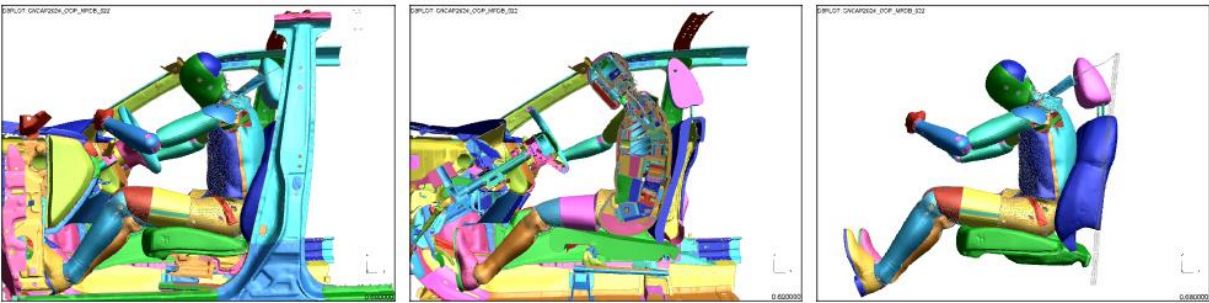
■ 制动阶段离位预测结果 (0~500ms)



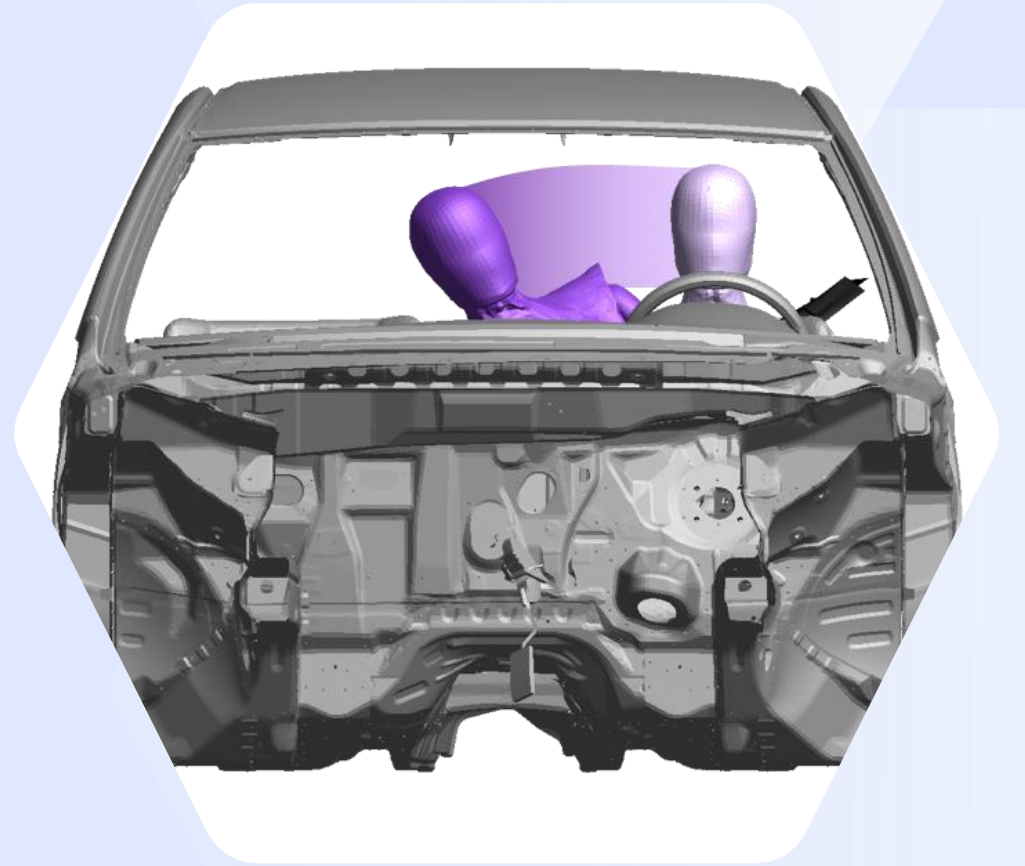
全局

过H点XZ剖视

只有假人、座椅、
安全带、气囊的动画



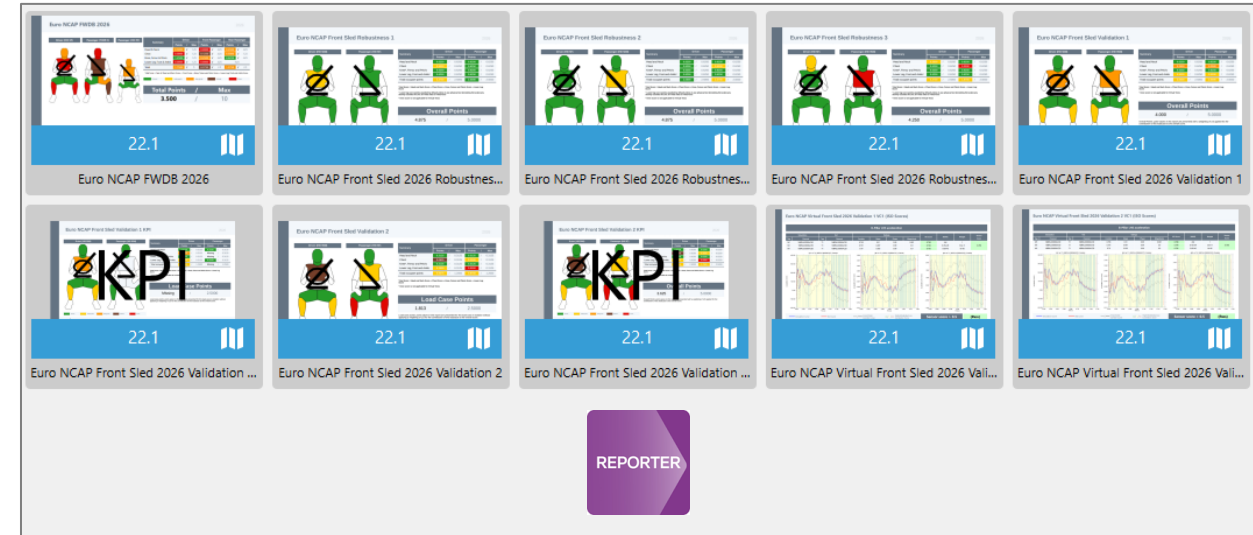
Euro NCAP 2026 Protocols



Euro NCAP Virtual Frontal Impact – Overview

In Oasys 22.1, support has been added for the 2026 Virtual Frontal Impact Protocol. This new protocol supports the following Crash Tests:

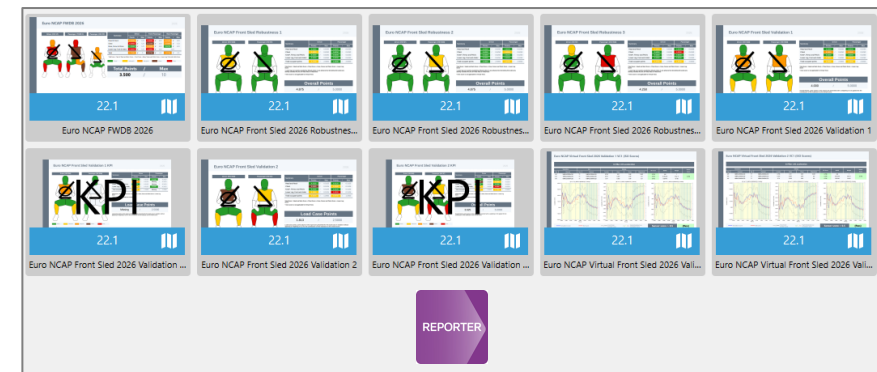
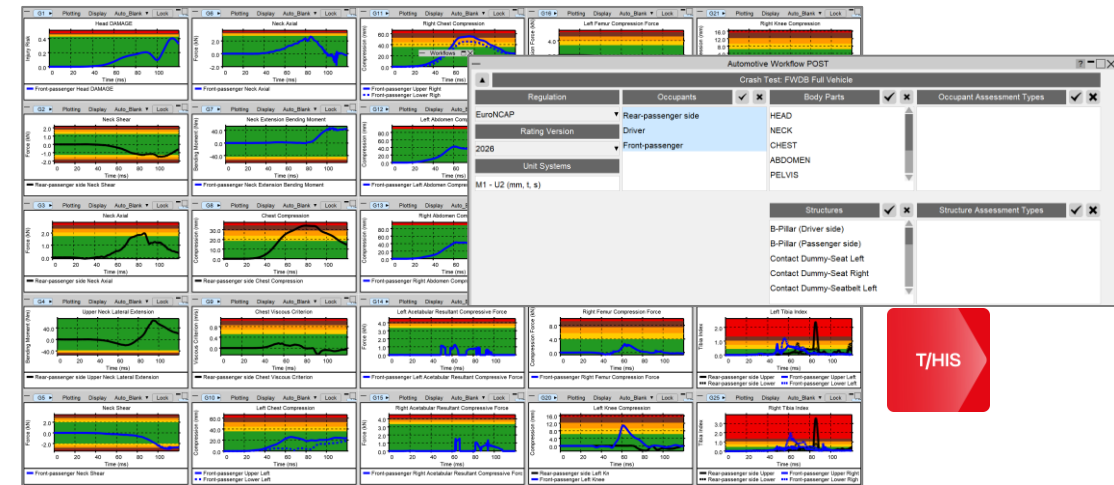
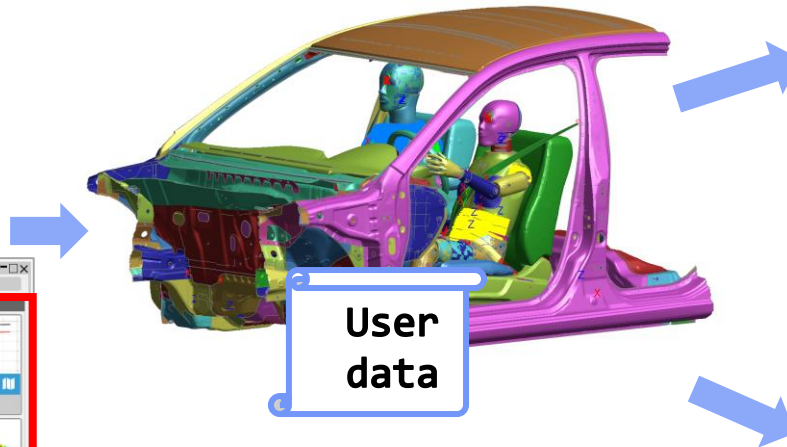
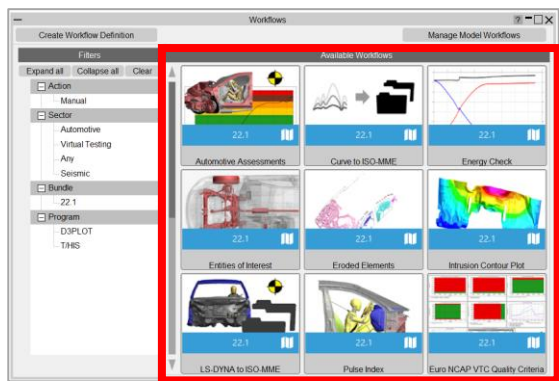
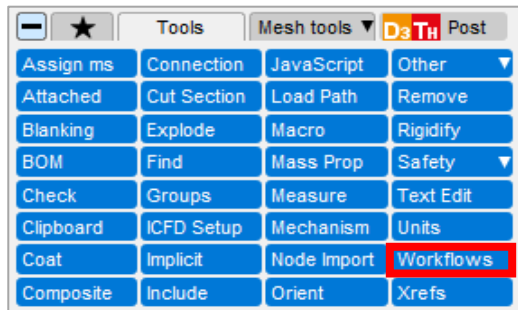
- Front Sled
 - Robustness 1
 - Robustness 2
 - Robustness 3
 - Validation 1
 - Validation 1 KPI
 - Validation 2
 - Validation 2 KPI
- Full Width Deformable Barrier (FWDB)
- All templates provide summary tables, graphs of injury criteria and calculate scores in compliance with Euro NCAP.



- Please see related documentation:
 - [Euro NCAP FWDB](#)
 - [Euro NCAP Validation](#)
 - [Euro NCAP Validation KPI](#)
 - [Euro NCAP Robustness](#)
 - [Euro NCAP Scoring & Colour Bands](#)
 - [Euro NCAP Points](#)

Euro NCAP Virtual Frontal Impact – Workflow

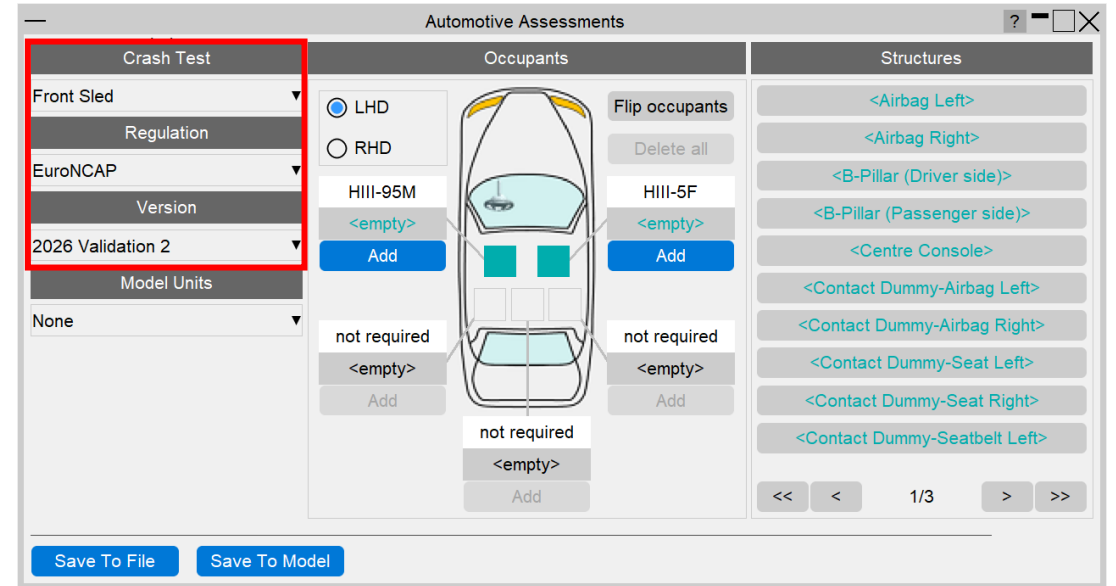
- The Euro NCAP Full Frontal protocol (including Occupant to Occupant Assessment) can now be produced in the official format template as requested by Euro NCAP. Set up your models in PRIMER, tag with user data using Workflows, and run the REPORTER Templates. Alternatively, outputs can be viewed interactively in T/HIS.



Automotive Assessments in PRIMER

- In Automotive Assessments in PRIMER, select **Regulation** → **Euro NCAP**
- Then, to configure the various new Euro NCAP Virtual Front Protocol load cases, select:

- **Crash Test** → **FWDB Full Vehicle**
 - **Version** → **2026**
- **Crash Test** → **Front Sled**
 - **Version** → **2026 Robustness 1**
 - **Version** → **2026 Robustness 2**
 - **Version** → **2026 Robustness 3**
 - **Version** → **2026 Validation 1**
 - **Version** → **2026 Validation 2**



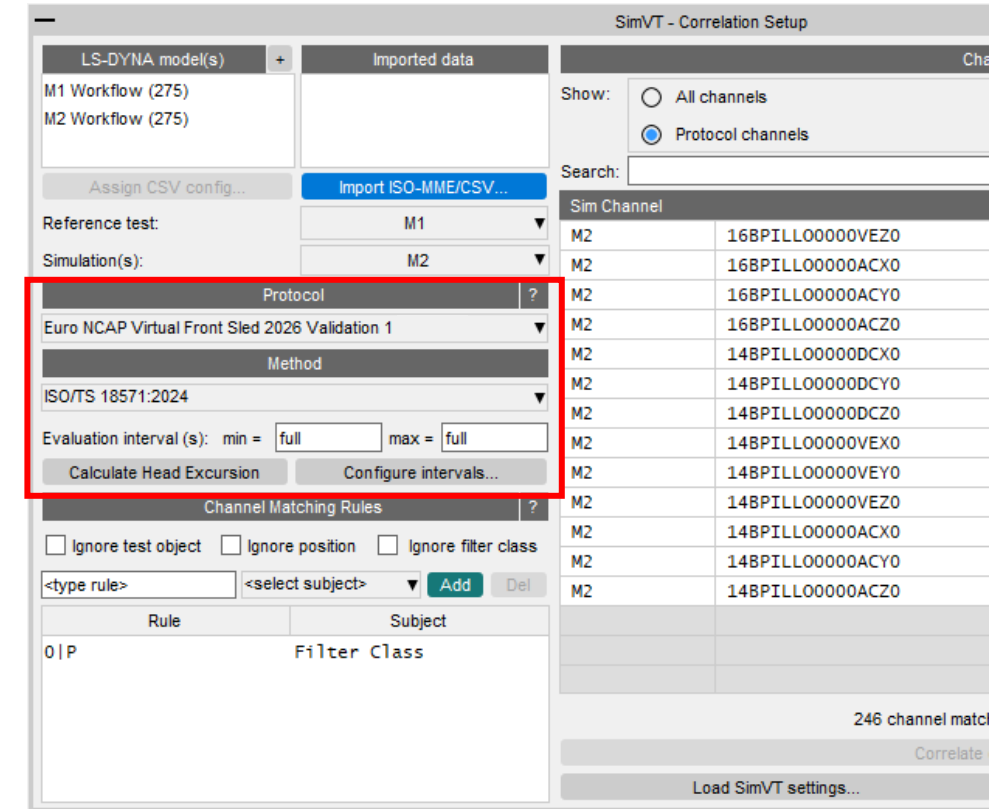
- Thereafter, proceed with setup as you would normally for Automotive Assessments ([see Automotive Assessments PRIMER documentation for details](#))

Automotive Assessments in PRIMER

The easiest way to use SimVT is to [save Automotive Assessments user data for your LS-DYNA models first](#).

Then:

1. In T/HIS, read the model results
2. Select **Tools** → **Workflows** → **SimVT**
3. Import ISO-MME/CSV data for your test/reference
4. Select one of the Euro NCAP Virtual Front protocols:
 - Euro NCAP Virtual Front Sled 2026 Validation 1
 - Euro NCAP Virtual Front Sled 2026 Validation 2
5. Proceed as normal for SimVT ([see SimVT documentation for details](#))



Euro NCAP Virtual Frontal Impact

Preview of Validation 1 KPI Template

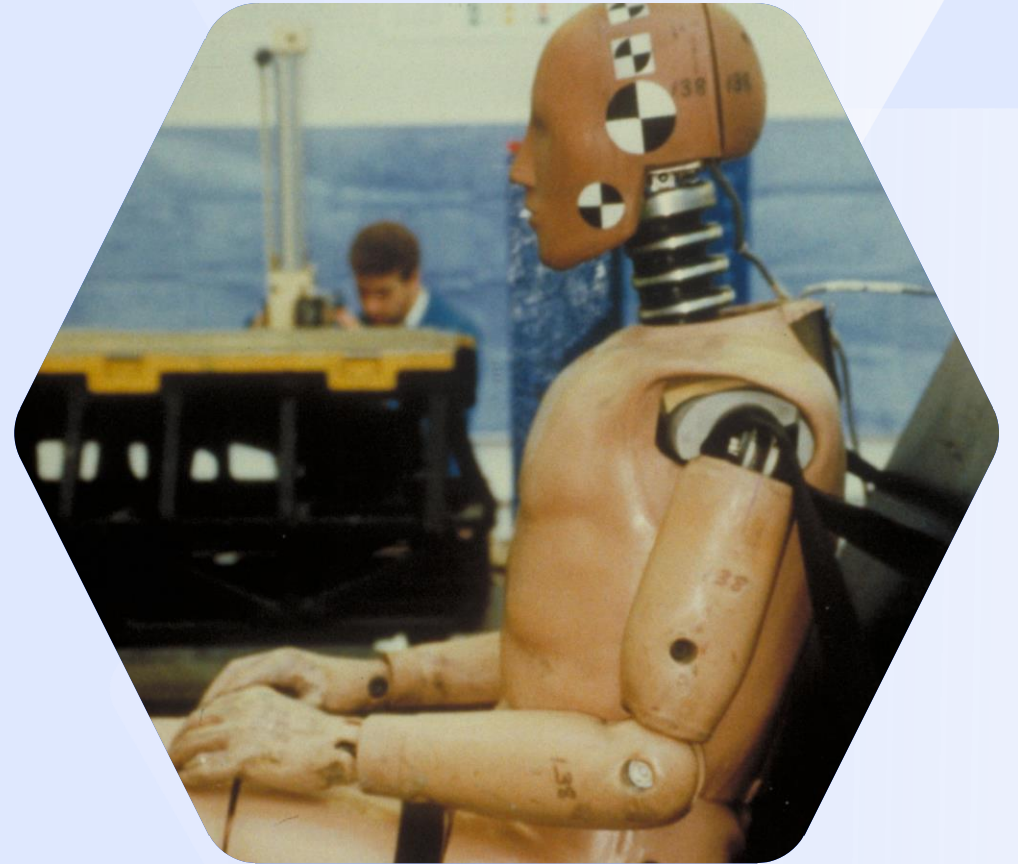


Euro NCAP Virtual Frontal Impact

Preview of FWDB Template



Working with Test Data



Improved unit handling and configuration for imported data

- Previously, imported ISO-MME data was assumed to be in SI units. This assumption was not always valid and data with non-standard units (e.g. accelerations in 'g' or rotations in 'degrees') needed to be manually scaled.
- Additionally, the vehicle drive side was inferred from the position code of the first occupant channel, which was assumed to be the driver.
- Now, when importing ISO-MME channel data, T/HIS attempts to automatically determine the units from the unit header in each channel file and the drive side from the "Driver position object 1" header in the MME file. However, it is not always possible to correctly infer this information.
- The new Import Configuration window (and Import Config. file) gives you the option to correct any issues with the channel units, polarity, scale and naming before importing ISO-MME or CSV data.

A	B	C	D
#DATA_SOURCE	/path/to/iso.mme		
#DRIVE_SIDE	LHD		
#PROTOCOL	None		
#UNITS			
TIME	ms		
ACCELERATION	g		
FORCE	kN		
LENGTH	mm		
MOMENT	kN*m		
ROTATIONAL_VELOCITY	deg/s		
VELOCITY	ft/s		
#CHANNEL_DATA			
Channel	New Name	Y Scale	Unit Type
11HEAD0000WSDCX0	<optional>	1	LENGTH
11HEAD0000WSDCY0	<optional>	1	LENGTH
11HEAD0000WSDCZ0	<optional>	1	LENGTH
11HEAD0000WSAVX0	<optional>	1	ROTATIONAL_VELOCITY
11HEAD0000WSAVY0	<optional>	1	ROTATIONAL_VELOCITY
11HEAD0000WSAVZ0	<optional>	1	ROTATIONAL_VELOCITY
11HEAD0000WSACX0	<optional>	1	ACCELERATION

Import
Config.
File

Import ISO-MME/CSV ...

Import ISO-MME or CSV data in
Automotive Assessments
and SimVT

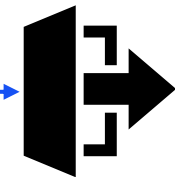
Configure import

Import Configuration

Apply Configuration file: Load Save Import additional channels from CSV...

Protocol: CNCAP Far Side Sled 2024 (WSID)
Drive side: LHD
Units: TIME s
ACCELERATION m/(s*s)
DISPLACEMENT m
ENERGY J
FORCE N
MASS kg
MOMENT Nm
ROTATION rad
ROTATIONAL_VELOCITY rad/s

Channel	New Name	Y Scale	Unit Type
HEAD_EXCURSION_X	<optional>	1	DISPLACEMENT
HEAD_EXCURSION_Y	<optional>	1	DISPLACEMENT
HEAD_EXCURSION_Z	<optional>	1	DISPLACEMENT
11HEAD0000WSACX0	<optional>	1	ACCELERATION
11HEAD0000WSACY0	<optional>	1	ACCELERATION
11HEAD0000WSACZ0	<optional>	1	ACCELERATION
11HEAD0000WSAVX0	<optional>	1	ROTATIONAL_VELOCITY
11HEAD0000WSAVY0	<optional>	1	ROTATIONAL_VELOCITY
11HEAD0000WSAVZ0	<optional>	1	ROTATIONAL_VELOCITY
11NECKL000WSFOY0	<optional>	1	FORCE
11NECKL000WSFOZ0	<optional>	1	FORCE
11NECKL000WSMOX0	<optional>	1	MOMENT
11SHLDRI00WSFOX0	<optional>	1	FORCE
11SHLDRI00WSFOY0	<optional>	1	FORCE
11SHLDRI00WSFOZ0	<optional>	1	FORCE
11THSP0400WSACX0	<optional>	1	ACCELERATION
11THSP0400WSACY0	<optional>	1	ACCELERATION
11THSP0400WSACZ0	<optional>	1	ACCELERATION
11PELV0000WSACX0	<optional>	1	ACCELERATION
11PELV0000WSACY0	<optional>	1	ACCELERATION



Data Imported

Import C-NCAP head excursion channel data from CSV file

- When importing ISO-MME or CSV test data, you can now import additional channels from a CSV file to associate them with the test data.
- The most common use case for this is to import a CSV with head excursion channel data that has been extracted from the physical test video footage using tracking software (e.g. as part of the C-NCAP Far Side 2024 protocols).

Import Configuration

Configuration file: Load Save **Import additional channels from CSV...**

Protocol: CNCAP Far Side Sled 2024 (WSID)
Drive side: LHD
Units: TIME

Channel	New Name
HEAD_EXCURSION_X	<optional>
HEAD_EXCURSION_Y	<optional>
HEAD_EXCURSION_Z	<optional>
11HEAD0000WSACX0	<optional>
11HEAD0000WSACY0	<optional>
11HEAD0000WSACZ0	<optional>
11HEAD0000WSAVX0	<optional>
11HEAD0000WSAVY0	<optional>
11HEAD0000WSAVZ0	<optional>
11NECKL000WSFOY0	<optional>
11NECKL000WSFOZ0	<optional>
11NECKL000WSMOX0	<optional>
11SHLDRI00WSFOX0	<optional>
11SHLDRI00WSFOY0	<optional>
11SHLDRI00WSFOZ0	<optional>
11THSP0400WSACX0	<optional>
11THSP0400WSACY0	<optional>
11THSP0400WSACZ0	<optional>
11PELV0000WSACX0	<optional>
11PELV0000WSACY0	<optional>

Import Data from Additional Channels

Import

Source: [Text Box]

Channel name row number: 1 ☒ Is imported data head excursion?
Units row number: 2 ☒ Show all rows
Start reading data from row number: 3

Name: Import? HEAD_EXCURSION_X HEAD_EXCURSION_Y HEAD_EXCURSION_Z
New name: Time HEAD_EXCURSION_X HEAD_EXCURSION_Y HEAD_EXCURSION_Z
Units: TIME mm mm mm
Zero data? ☒ ☒ ☒ ☒

Row #	A	B	C	D
1	CHANNELS	HEAD_EXCURSION_X	HEAD_EXCURSION_Y	HEAD_EXCURSION_Z
2	TIME	mm	mm	mm
3	0.00000	0.00000	0.00000	0.00000
4	9.99810e-4	2.44141e-4	-1.83105e-4	7.07775e-17
5	1.99962e-3	9.76563e-4	-1.22070e-3	1.22070e-4
6	2.99943e-3	1.46484e-3	-2.19727e-3	7.32422e-4
7	3.99987e-3	-4.88281e-4	-5.49316e-4	2.28882e-3
8	4.99968e-3	-8.30078e-3	9.03320e-3	4.85229e-3
9	5.99949e-3	-2.70996e-2	3.38135e-2	8.85010e-3
10	6.99993e-3	-6.07910e-2	8.02002e-2	1.39771e-2
11	7.99974e-3	-1.13770e-1	0.153809	1.99280e-2
12	8.99955e-3	-1.91895e-1	0.264893	2.67029e-2
13	9.99999e-3	-3.06641e-1	0.429504	3.39355e-2
14	1.09998e-2	-4.69482e-1	0.665710	4.17175e-2
15	1.19996e-2	-6.88477e-1	0.985352	5.01099e-2
16	1.29994e-2	-9.62646e-1	1.38715	5.93872e-2
17	1.39999e-2	-1.28223	1.85797	6.93054e-2
18	1.49997e-2	-1.63599	2.38013	7.95288e-2
19	1.59995e-2	-2.01611	2.94177	8.96606e-2
20	1.69999e-2	-2.42090	3.54181	9.96704e-2

1 ACCELERATION
1 ACCELERATION
1 ACCELERATION
1 ACCELERATION

Time of first sample

To accommodate the pre-crash (settling) phase in a simulation, a new “Time of first sample” input has been added to the Automotive Assessments workflow set-up in PRIMER.

Automotive Assessments and SimVT

- In accordance with ISO-MME convention a **negative** time value is used to shift the start time of the output curves when post-processing using the Automotive Assessments or SimVT workflows in T/HIS.
- For example, if your analysis begins with 200 milliseconds of set-up (e.g. seat squash etc.) before the crash test load case commences then you would enter -0.2 in the “Time of first sample” input to shift the curves so that the crash test will effectively start at $t=0$.
- Any data before $t=0$ is automatically discarded.

LSDYNA to ISO-MME

- The “Time of first sample” value is also used by the LS-DYNA to ISO-MME workflow.
- If it is defined, then the “Time of first sample” header value will automatically be set in the channel files.
- Note that in this instance the samples which are shifted to time < 0 will not be discarded as this only happens when the ISO-MME data is processed.

```
Test object number      :1
Name of the channel     :Accel x - Node 10001 : ( HEAD0000WSAC) (Reg 0.100E-03)
Laboratory channel code :NOVALUE
Customer channel code   :NOVALUE
Channel code            :11HEAD0000WSACX0
Unit                    :m/(s*s)
Reference system        :NOVALUE
Pre-filter type         :NOVALUE
Cut off frequency       :NOVALUE
Channel amplitude class :NOVALUE
Sampling interval       :0.0001
Bit resolution          :NOVALUE
Time of first sample    :-0.02
Number of samples       :2000
0
-2.86178e-08
-5.19904e-09
```

LS-DYNA to ISO-MME Improvements

LS-DYNA to ISO-MME

Assessments User Data		Solver Information	
Front Sled		Solver Name:	LS-DYNA
EuroNCAP		Solver Version:	SP
2026 Robustness 1		Solver Precision:	RHE8
Platform Name:			
Simulation Information			
Number of CPUs:	32	Time step setting:	7.2e-7
Contact type between dummy and seat:	SURFACE SOFT=	Contact type between dummy and seatbelt:	SURFACE SOFT=
Contact type between dummy and airbag:	SURFACE SOFT=1	Number of contacts used in the overall simulation setup:	54
Number of elements:	2202649	Mass of total setup in kg:	410.73
Mass of driver dummy in kg:	79.09	Mass of passenger dummy in kg:	49.53
Mass of seat in kg:	28.32	Mass of sled in kg:	N/A
Mass of centre console in kg:	N/A		
<button>Calculate</button>			
Vehicle data			
Name:	TUG		
Reference number:	1234		
Longitudinal velocity:	N/A		
Lateral velocity:	N/A		
Velocity:	35		
Mass:	1000		
Impactor data			
Name:			
Velocity:			

Textbox fields with this colour are required for success
Note that all fields are required to conform to the

Support for Euro NCAP 2026

- Added new inputs according to Euro NCAP 2026 protocol
- We have also disabled the inputs which are not applicable according to version (e.g. 2024 or 2026)
- Added support for frontal VTC protocol channels export

LS-DYNA to ISO-MME

Automotive Assessments User Data	
Automotive Assessments Crash Test:	Front Sled
Automotive Assessments Regulation:	EuroNCAP
Automotive Assessments Version:	2026 Robustness 1

User Data	
Test name:	Front Sled 2026 Robustness 1
Laboratory name:	Oasys Ltd
Customer name:	Euro NCAP
Customer test ref number:	001
Customer project ref number:	1234
Virtual testing ref ID:	Other - fill in textbox below dropdown
Subtype of test:	Virtual-Mid
Test date:	<input checked="" type="radio"/> Today <input type="radio"/>
ISO-MME format:	1.6
Title:	Euro NCAP 2026
Regulation:	N/A
Type of data source:	Simulation
Dummy Simulation Model Driver:	Hill v1.7 (Humanetics)
Dummy Qualification Ref Driver:	NA_TECHNICAL_REPORT_USER_MANUAL.pdf
Dummy Simulation Model Passenger:	Hill v2.0 (Humanetics)
Dummy Qualification Ref Passenger:	NA_TECHNICAL_REPORT_USER_MANUAL.pdf
Distance between head CoG and green line (in metres):	N/A
Distance between head CoG and yellow line (in metres):	N/A
Distance between head CoG and orange line (in metres):	N/A
Distance between head CoG and red line (in metres):	N/A
Required output channels CSV:	Is/EuroNCAP_FRONT_SLED_R1_LHD.csv
Output directory:	NCAP_Front_Sled_R1\lsdyna_to_isomme

Export

Solver Information	
Solver Name:	LS-Dyna
Solver Version:	ls-dyna_mpp_s_R11_2_2
Solver Precision:	SP
Platform Name:	RHE8

Simulation Information	
Number of CPUs:	32
Time step setting:	7.2e-7
Contact type between dummy and seat:	SURFACE SOFT=1 FS=0.2
Contact type between dummy and seatbelt:	SURFACE SOFT=1 FS=0.2
Contact type between dummy and airbag:	SURFACE SOFT=1 FS=0.2
Number of contacts used in the overall simulation setup:	54
Number of elements:	2202649
Mass of total setup in kg:	410.73
Mass of driver dummy in kg:	79.09
Mass of passenger dummy in kg:	49.53
Mass of seat in kg:	28.32
Mass of sled in kg:	N/A
Mass of centre console in kg:	N/A

Calculate

Vehicle data	
Name:	TUG
Reference number:	1234
Longitudinal velocity:	N/A
Lateral velocity:	N/A
Velocity:	35
Mass:	1000

Impactor data	
Name:	-
Velocity:	-

Textbox fields with this colour are required for successful LS-DYNA to ISO-MME conversion.
Note that all fields are required to conform to the Euro NCAP VTC protocol.

Mass calculation and Platform name update

- PRIMER workflow:
 - Replaced “Calculate Mass” with **“Check mass”** (the previous calculation could omit mass that was part of an encrypted keyword file).
 - Removed functionality which obtained the platform name from d3hsp/otf as it was reporting platform on which LS-DYNA was built on rather than where analysis was run. **Platform name** is now a manual input in the PRIMER workflow.
- T/HIS workflow:
 - Mass calculation for mass of different parts now works using the d3hsp/otf file rather than relying on the d3thdt/thf file.

The screenshot displays the LS-DYNA to ISO-MME interface, which is divided into several sections for configuring simulation parameters. The 'Automotive Assessments User data' section includes fields for 'Crash Test' (Front Sled), 'Regulation' (EuroNCAP), and 'Version' (2026 Robustness 1). The 'User data' section contains fields for 'Test name', 'Laboratory name', 'Customer name', 'Customer test ref number', 'Customer project ref number', 'Virtual testing ref ID', 'Subtype of test', 'Test date', 'ISO-MME format', 'Title', 'Regulation', 'Type of data source', 'Dummy Simulation Model Driver', 'Dummy Qualification Ref Driver', 'Dummy Simulation Model Passenger', 'Dummy Qualification Ref Passenger', and 'Required output channels CSV'. The 'Contact data' section includes 'Contact Type between dummy and seat', 'Contact Type between dummy and seatbelt', and 'Contact Type between dummy and airbag'. The 'Vehicle data' section includes 'Name', 'Reference number', 'Longitudinal velocity', 'Lateral velocity', 'Velocity', and 'Mass'. The 'Impactor data' section includes 'Name' and 'Velocity'. The 'Distance between head CoG and excursion lines' section includes four distance fields. The 'Mass of parts' section includes a 'Check mass' button. The 'Simulation Information' section includes a 'Platform Name' field, which is highlighted with a red box and contains the value 'RHE8'. A red box also highlights the 'Check mass' button. A note at the bottom states: 'Textbox fields with this colour are required for successful LS-DYNA to ISO-MME conversion. Note that all fields are required to conform to the Euro NCAP VTC protocol.'

REPORTER Template update

- The MME header table in the report is now updated dynamically depending on the header contents.

LS-DYNA to ISO-MME

EuroNCAP Front Sled 2026 Robustness 1

MME Headers	
Description	Value
Data format edition number	1.6
Laboratory name	Oasys Ltd
Customer name	Euro NCAP
Customer test ref. number	001
Customer project ref. number	1234
Title	Euro NCAP 2026
Timestamp	3/11/2025, 3:39:42 pm
Type of the test	Frontal Impact
Subtype of the test	Virtual-Mid
Date of the test	3/11/2025
Name of test object 1	TUG
Ref. number of test object 1	1234
Velocity test object 1	35
Mass test object 1	1000
Driver position object 1	1
Impact side test object 1	FR
Name of test object 2	-
Velocity test object 2	-
Type of data source	Simulation

Model

C:\Cases\Case_52799\post\1-his\EuroNCAP_FRONT\FRONT_SLED_R1\post_light_52799_EuroNCAP_Front_Sled_R1\05_Virtual-Sled-Robustness1-35kmph_002.key

Required output channel CSV

C:\SOURCE22\workflow_wizard_trunk_for_checking_post534\workflow_definitions\scripts\ldyna_to_issomme\EuroNCAP_VTC_Channels\EuroNCAP_FRONT_SLED_R1_LHD.csv

Output directory

C:\Cases\Case_52799\post\1-his\EuroNCAP_FRONT\FRONT_SLED_R1\post_light_52799_EuroNCAP_Front_Sled_R1\ldyna_to_issomme

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LS-DYNA to ISO-MME

EuroNCAP Front Sled 2026 Robustness 1

MME Headers	
Description	Value
.Dummy Simulation Model Driver	HIII v1.7 (Humanetics)
.Dummy Qualification Ref Driver	HUMANETICS_HIII_50M_V1.7_HARMONIZED_LS_DYNA_TECHNICAL_REPORT_USER_MANUAL.pdf
.Dummy Simulation Model Passenger	HIII v2.0 (Humanetics)
.Dummy Qualification Ref Passenger	HUMANETICS_HIII_SF_V2.0_HARMONIZED_LS_DYNA_TECHNICAL_REPORT_USER_MANUAL.pdf
.Solver Name	LS-Dyna
.Solver Version	ls-dyna_mpp_s_R11_2_2
.Solver Precision	SP
.Platform Name	RHEB
.Number of CPUs	32
.Time step setting	NOVALUE
.Contact Type dummy -seat	AUTOMATIC_SURFACE_TO_SURFACE SOFT=1 FS=0.2
.Contact Type dummy -belt	AUTOMATIC_SURFACE_TO_SURFACE SOFT=1 FS=0.2
.Contact Type dummy -airbag	AUTOMATIC_SURFACE_TO_SURFACE SOFT=1 FS=0.2
.Number of contacts	54
.Number of elements	2202649
.Mass of total setup in kg	410.73
.Mass of dummy 1 in kg	79.09
.Mass of dummy 2 in kg	49.53
.Mass of seat in kg	28.32

Model

C:\Cases\Case_52799\post\1-his\EuroNCAP_FRONT\FRONT_SLED_R1\post_light_52799_EuroNCAP_Front_Sled_R1\05_Virtual-Sled-Robustness1-35kmph_002.key

Required output channel CSV

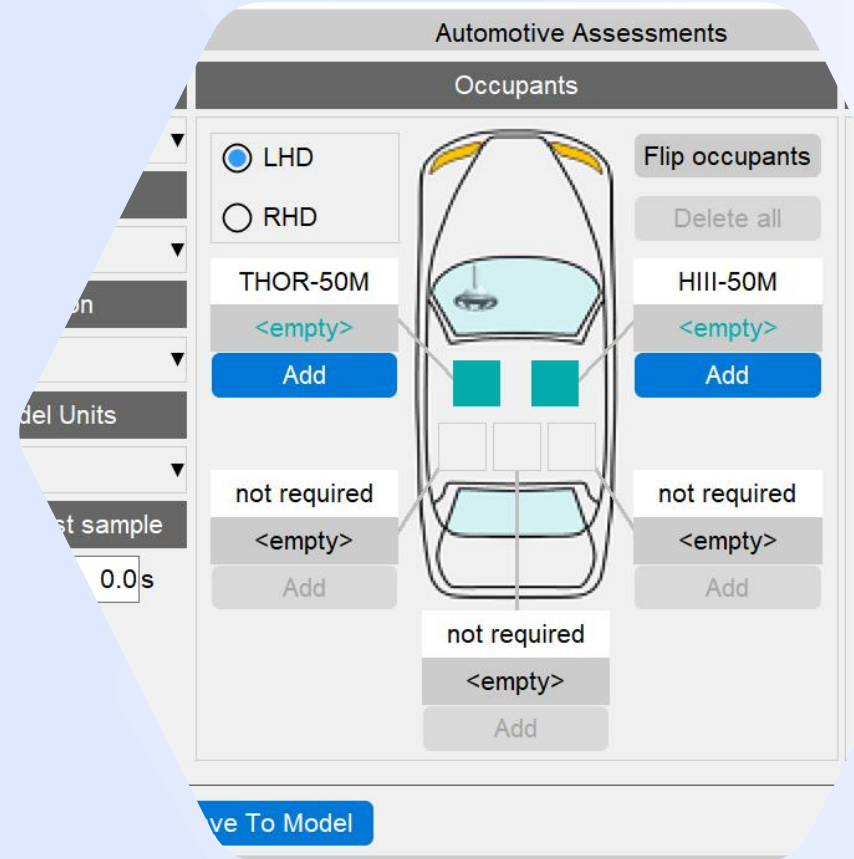
C:\SOURCE22\workflow_wizard_trunk_for_checking_post534\workflow_definitions\scripts\ldyna_to_issomme\EuroNCAP_VTC_Channels\EuroNCAP_FRONT_SLED_R1_LHD.csv

Output directory

C:\Cases\Case_52799\post\1-his\EuroNCAP_FRONT\FRONT_SLED_R1\post_light_52799_EuroNCAP_Front_Sled_R1\ldyna_to_issomme

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Automotive Assessments Improvements



Automotive Assessments Improvements

- Entity IDs that are defined but don't have corresponding *DATABASE_HISTORY_XXXX keyword defined are now shown with a latent cyan-coloured textbox background:

HEAD		
Head: Global Coordinates (X,Y,Z)	node	10123
Head: Acceleration, Velocity (X,Y,Z)	node	10001
Head: Angular Accel. Angular Velocity. Angle (X,Y,Z)	node	10006
Head Offset (for C-NCAP calculation)	node	32198

- A window is now mapped when such entity IDs are selected or typed into the text box, giving you the option to create the corresponding *DATABASE_HISTORY_XXXX keyword for them. It also provides an option to select the include file to which the keyword will be added. **Note:** you have to save the include and re(run) the analysis to obtain results for the corresponding entity.

Create *DATABASE_HISTORY_NODE?

*DATABASE_HISTORY_NODE not present for 32198. Do you wish to create it?

Create in Include: 08_FS_AEMDB_75_x-ref_z-ref_50M_Sim_1.key

☒ Update Current Layer Include

☐ Title:

Create Cancel

Dropdown to select the include file

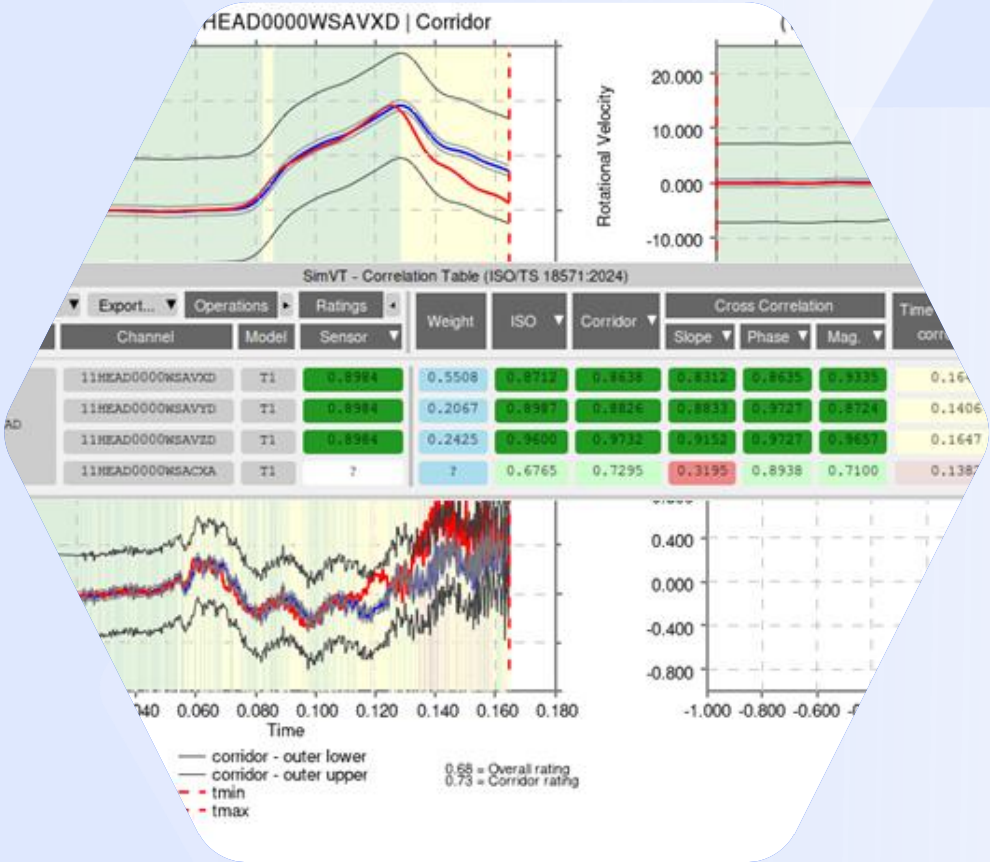
If ticked, then the current layer include will be updated to the one selected in the dropdown above

Option to provide optional Title

Automotive Assessments Improvements

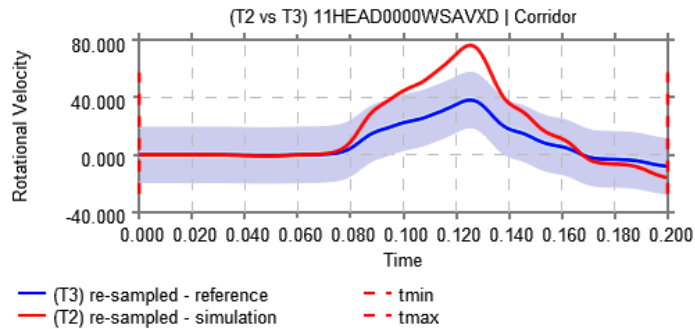
- The ISO channel codes have been updated for several channels in the Far Side VTC v1.1 draft protocol. The necessary changes have been incorporated in Automotive Assessments workflows tool, and backward compatibility support has been added for the older ISO codes. The channels whose ISO codes have changed are:
 - LAP Belt (SEBE000**3**B6FO00 to SEBE000**0**B6FO00)
 - Shoulder Belt (SEBE000**3**B3FO00 to SEBE000**0**B3FO00)
 - Contact Dummy-Airbag (**ARB**G0000WSFOX/Y/Z to **AIRB**0000WSFOX/Y/Z)
 - Thoracic Spine 04 and 12 Displacements (THSP04/1200**00**DCX/Y/Z0 to THSP04/1200**WS**DCX/Y/Z0).
- The 'Far Side + VTC' and 'Far Side' crash tests have been renamed to 'Far Side Sled' for consistency across the tools. The version for the former 'Far Side + VTC' is now 2024, while the version for the former 'Far Side' crash test is 2022. Support for backward compatibility has also been added.
- The term 'Physiology' has been renamed to 'Anthropometry' and support for backward compatibility has also been added.
- Users can now select multiple contacts for contact structures (Contact Dummy – Airbag, Contact Dummy – Centre Console, Contact Dummy –Seat and Contact Dummy - Seatbelt) via SELECT option.
- The WSID 50M dummy supplier has been renamed from “PDB” to "DYNAmore-PDB" to make it clearer that the dummy is from DYNAmore and co-developed with the PDB consortium.
- Acceleration curves from LS-DYNA results can now be derived by differentiating velocity curves (instead of raw acceleration output) by ticking the “Use dv/dt” option in PRIMER Automotive Assessments before saving user data. This option is honoured by SimVT and LS-DYNA to ISO-MME workflows which utilise Automotive Assessments user data.
- Added support to locate and load FEMZIP files in REPORTER templates when original d3plot results files have been deleted.

SimVT

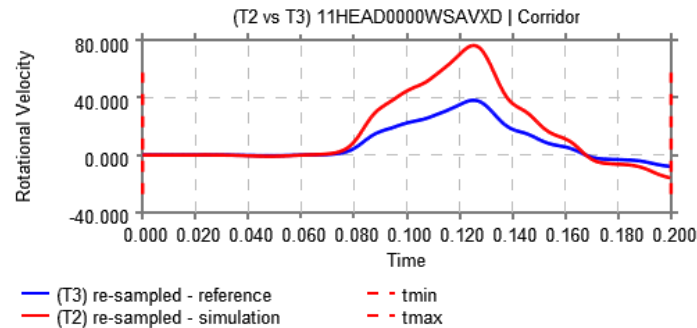


SimVT: Graph Options – Show Corridors

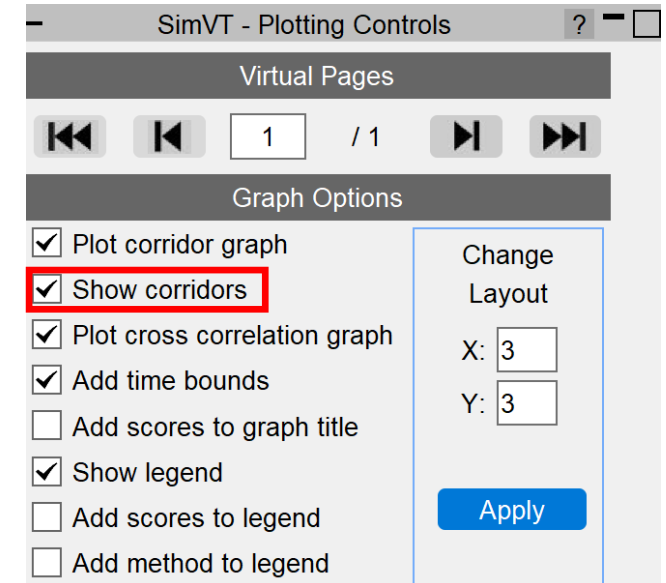
- A new graph option “Show corridors” has been added to SimVT plotting controls. This determines whether the inner and outer corridors are plotted along with the reference and simulation curves.
- Deselecting show corridors can help reduce clutter on the graphs.



Corridors turned on

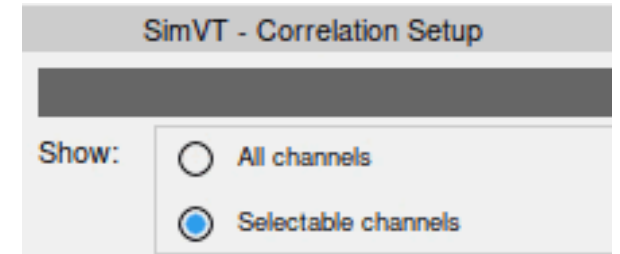


Corridors turned off



SimVT: Improvements

- The performance of SimVT has improved when loading a large number of channels and when switching the channel table to show “All Channels”.

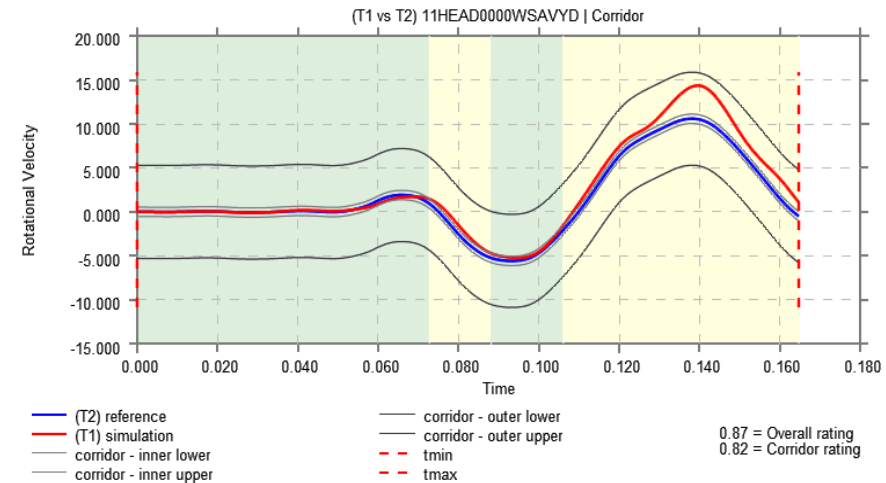
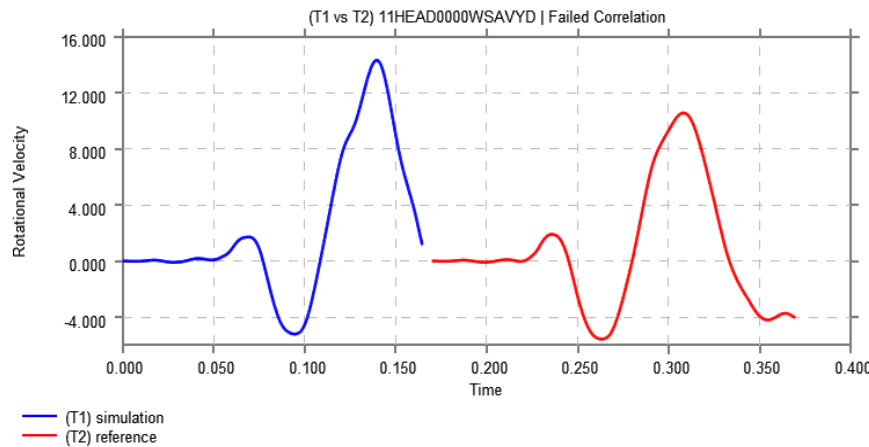


SimVT: Diagnostic Tools

- In Virtual Testing, once the problem of data submission is overcome, the real challenge begins: **how to achieve an excellent safety rating?**
- **Achieving good correlation between simulation and test is crucial** – without good correlation in the validation loadcases, the virtual loadcases count for nothing and the overall score is low.
- SimVT now contains a set of **diagnostic tools** to help you **rapidly pinpoint problem areas** in your simulations and identify the **sources of poor correlation** – enabling you to **correct models, improve the robustness of designs, and maximise your safety rating.**

SimVT: Error Graphs when results cannot be correlated

- If a correlation fails, error graphs will be shown. A common example of when a correlation might fail is when the simulation and reference curves are not aligned in time. This helps you identify any issues with the input data, and with this insight, you can correct any issues.
- An example is shown below with simulation and reference curves before correction (left), and after correction with correlation applied (right).



- The curves can be made to overlap using the operations panel available in the Correlation Table (e.g. by using ADDX, etc to meaningfully shift the simulation curve in time to overlap).

SimVT: Correlation Table Filtering

- To help you navigate and analyse results more efficiently, SimVT now includes filtering controls in column headers.
- When filters are applied, rows that do not meet the selected criteria are hidden from view.
- These controls allow you to filter by various rating thresholds (e.g., pass/fail, with min/max values, etc).
- This feature improves usability, especially when working with large datasets, and ensures that you can quickly identify areas of interest or concern.

Drop down boxes for the score filters

Back

Auto plot

Re-plot

Export...

Operations

Ratings

Object

Location

Channel

Model

Sensor

Weight

ISO

Corridor

Cross Correlation

Slope

Phase

Mag.

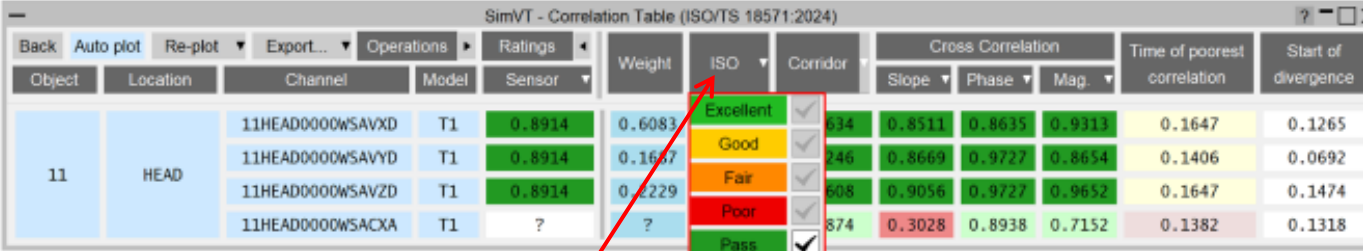
Time of poorest correlation

Start of divergence

11	HEAD	11HEAD0000WSAVXD	T1	0.8914	0.6083	0.8745	0.8634	0.8511	0.8635	0.9313	0.1647	0.1265
		11HEAD0000WSAVYD	T1	0.8914	0.1687	0.8708	0.8246	0.8669	0.9727	0.8654	0.1406	0.0692
		11HEAD0000WSAVZD	T1	0.8914	0.2229	0.9530	0.9608	0.9056	0.9727	0.9652	0.1647	0.1474
		11HEAD0000WSACXA	T1	?	?	0.6973	0.7874	0.3028	0.8938	0.7152	0.1382	0.1318

SimVT: Correlation Table Filtering

- The rating categories available include Excellent, Good, Fair, and Poor, and Pass and Fail (available when the protocol is set).
- The optional Pass and optional Fail filter checkboxes are displayed with brackets around them.
- There is also an Invalid checkbox which can be used to filter out any rows with any scores that had issues in obtaining the result.
- For ease of use, only the relevant checkboxes are active (ungreyed) when the popup appears.
- Additionally, you can set the Min and Max values to limit values between a certain threshold.
- You can use the Clear Filters button to remove all applied filters and restore the full dataset. Directly beneath this, a Close button allows users to exit the filter popup.

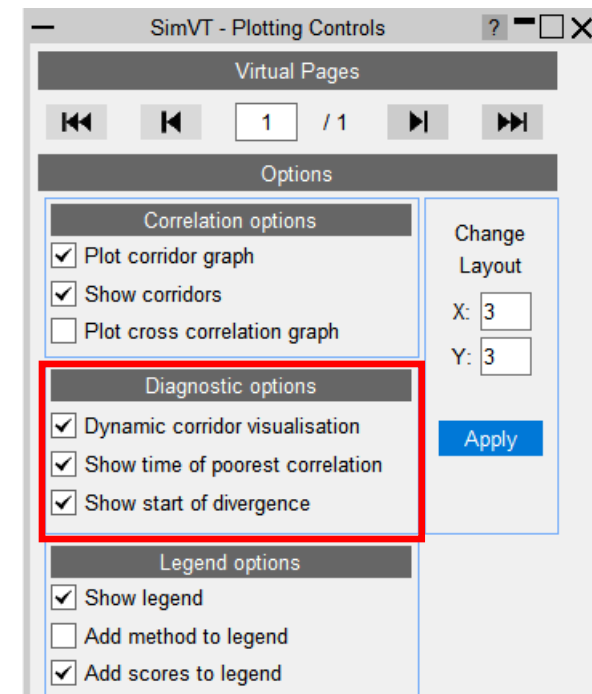
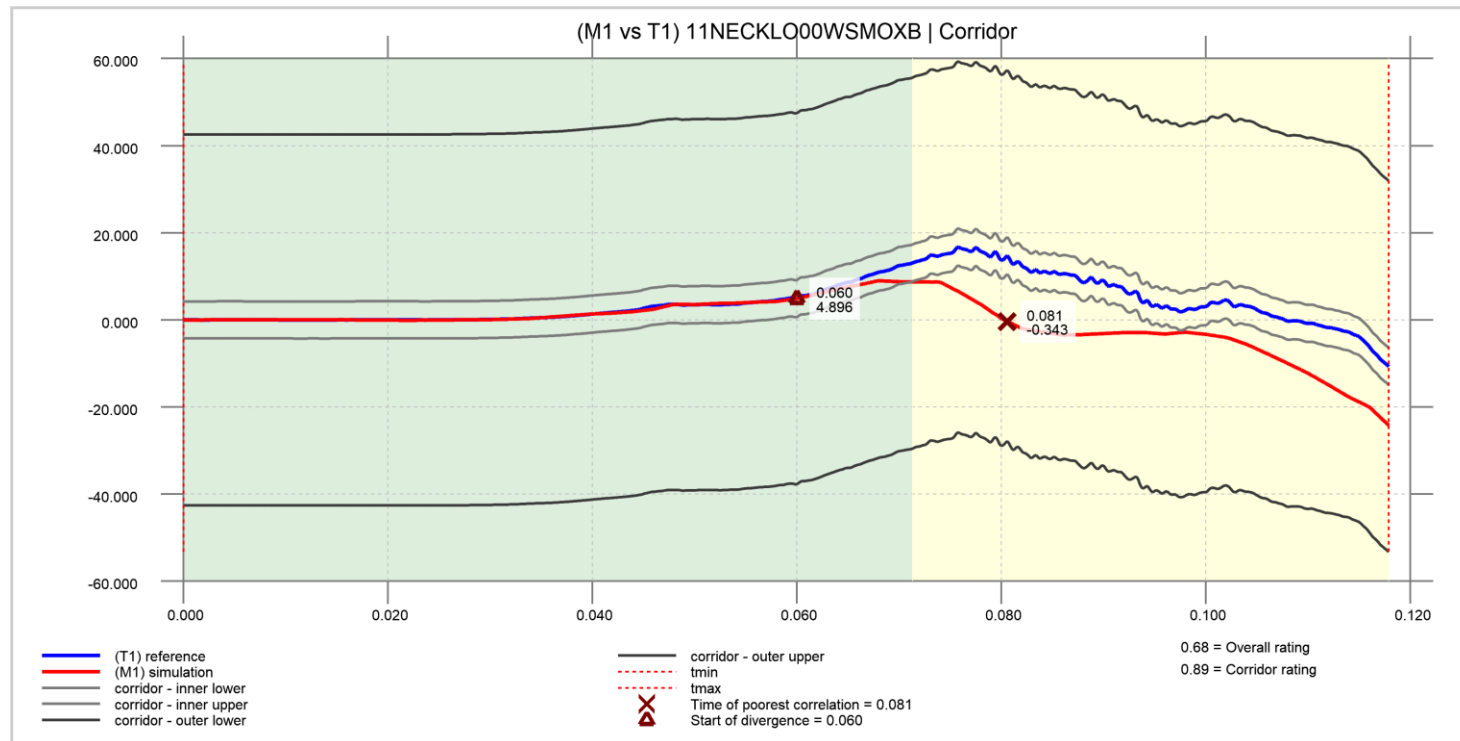


The screenshot displays the SimVT - Correlation Table (ISO/TS 18571:2024) interface. The main table has columns: Object, Location, Channel, Model, Sensor, Weight, ISO, Corridor, Cross Correlation (Slope, Phase, Mag), Time of poorest correlation, and Start of divergence. A red arrow points to the ISO column header, which has a dropdown menu open. The dropdown menu lists rating categories: Excellent, Good, Fair, Poor, Pass, Fail, (Pass), (Fail), Invalid, Min (0.0000), Max (1.0000), Clear Filters, and Close. The table data shows various channels and models with corresponding ISO ratings and correlation values.

To access them, right click on the header above a rating column (e.g. ISO).

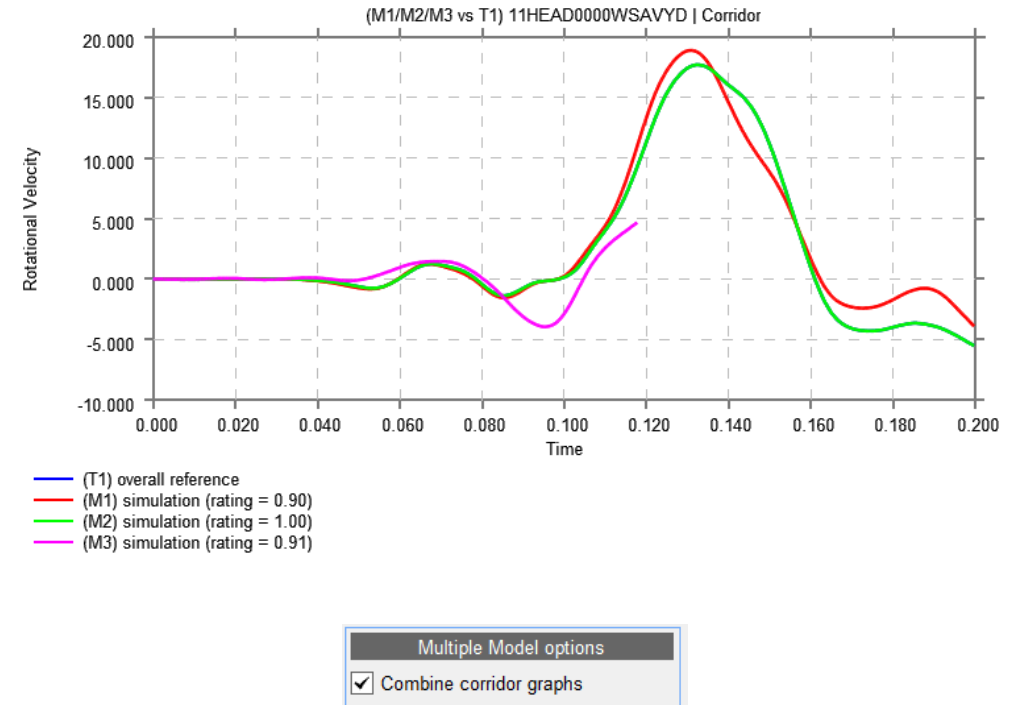
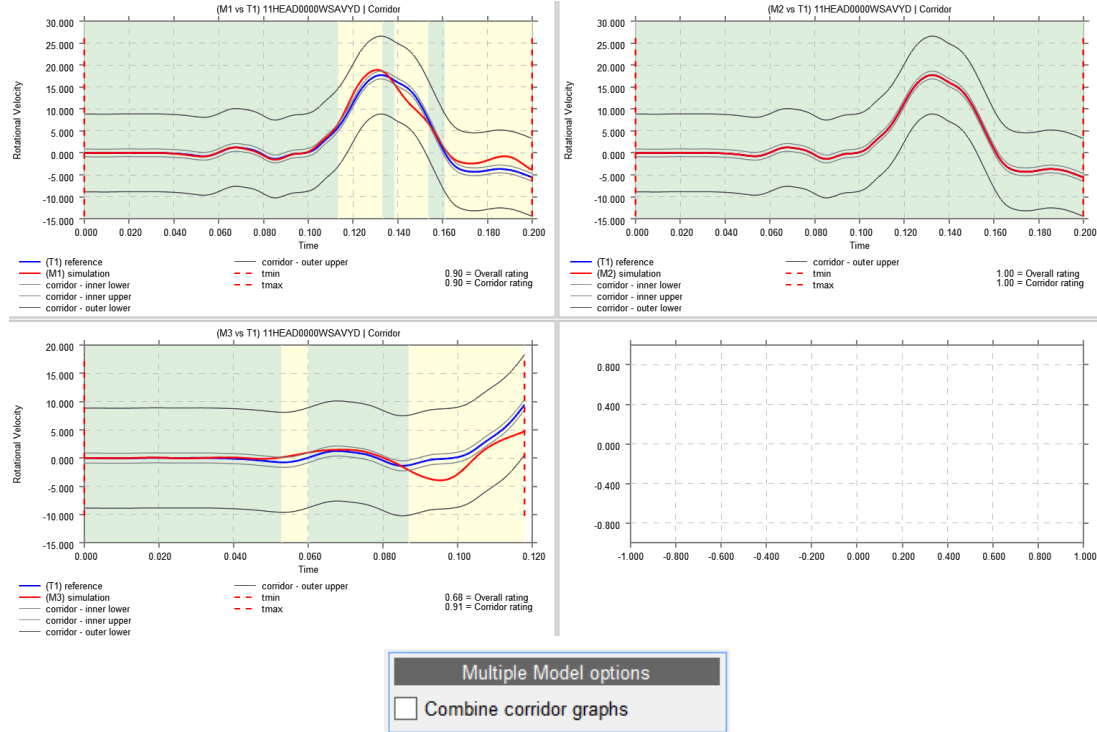
SimVT: Dynamic Corridor Visualisation and Event Identification

- A new option “**Dynamic corridor visualisation**” has been added to help you visualise corridor performance over time and pinpoint problem areas quickly. When activated, it highlights **High correlation zone**, **Moderate correlation zone** and **Low correlation zone** over time.
- New options “**Show time of poorest correlation**” and “**Show start of divergence**” help you rapidly identify key time events in your analysis that could be causing poor correlation.

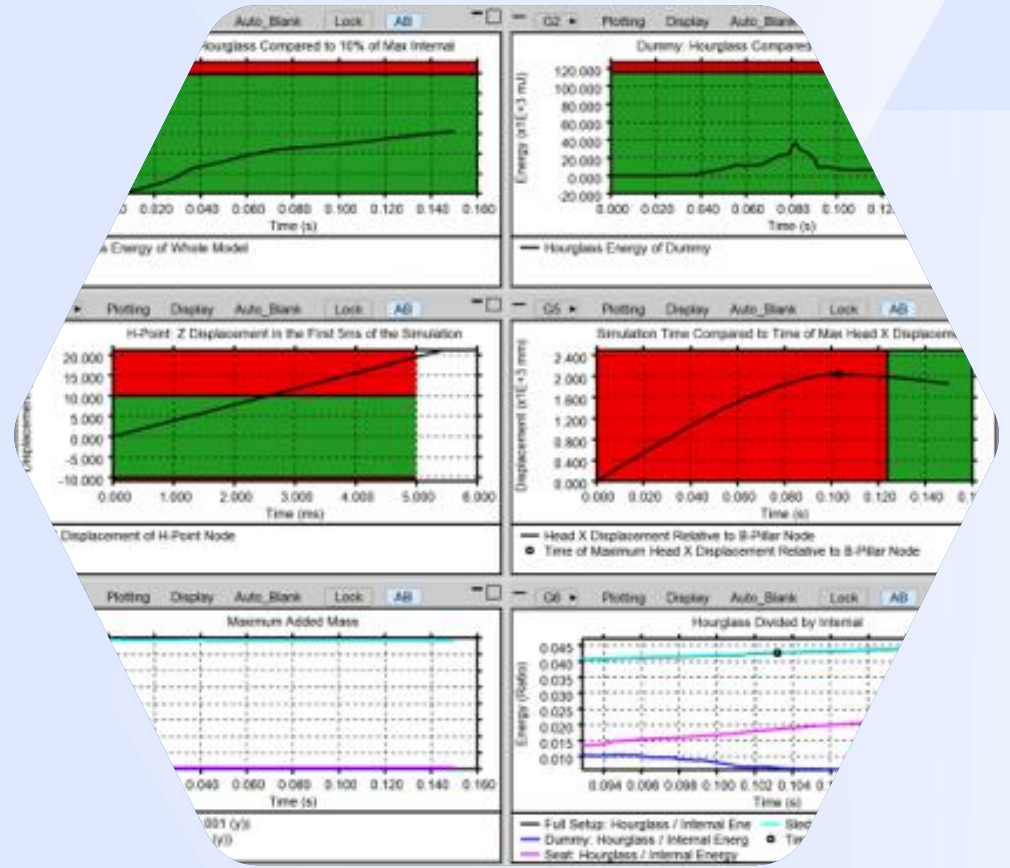


SimVT: Overlaying multiple model results

- A new option **Combine corridor graphs** has been added, which controls if corridor graphs that share the same channel are combined in a single graph.
- Below is an example of a combination of plots with **Combine corridor graphs** unticked (left) and ticked (right).

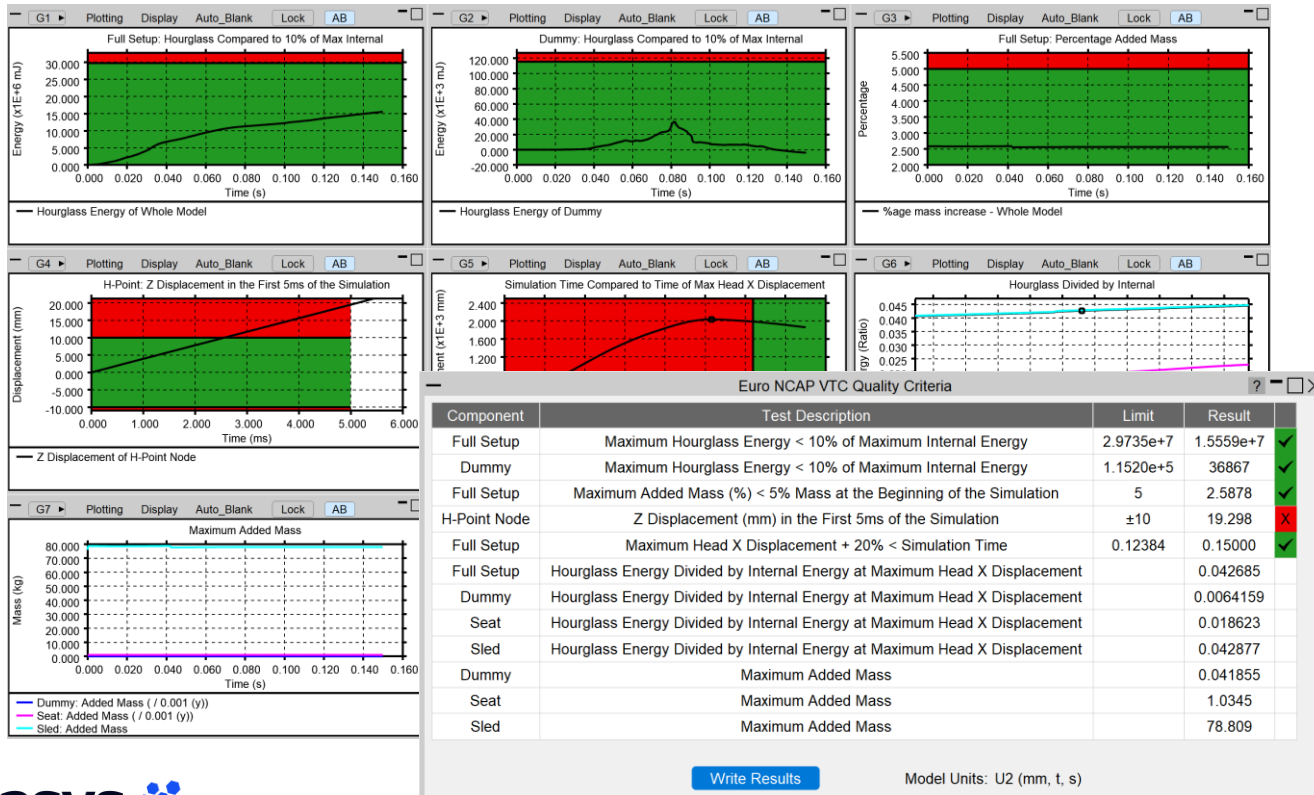


VTC Quality Criteria Workflows



Quality Criteria – Euro NCAP Frontal

- The Euro NCAP VTC Quality Criteria Workflows tool and associated REPORTER Template are now capable of assessing the Euro NCAP Virtual Frontal Simulation & Assessment Protocol (draft) as well as the existing Far Side protocol.



Euro NCAP VTC Quality Criteria

Test Type: Frontal (Draft)

Model Unit System: U2 (mm, t, s)

Display Time Unit: Seconds [s]

Display Energy Unit: Millijoules [mJ]

Display Displacement Unit: Millimetres [mm]

Display Mass Unit: Kilograms [kg]

Dummy Parts: 1030 PARTs selected

Head History Node (Global): 01HEAD0000T3ACX

H-point History Node: 01PELV0000T3ACZ

B-pillar History Node: 45011535

Seat Parts: 109 PARTs selected

Save To File Save To Model

Quality Criteria – Euro NCAP HBM

- The Euro NCAP HBM Quality Criteria Workflows tool and associated REPORTER Template allow you to perform the quality checks outlined in Section 7.1 of the Euro NCAP VTC HBM Frontal Protocol (draft) relating to energy, added mass and displacements.



Euro NCAP HBM Quality Criteria

Model Unit System: U3 (mm, kg, ms) ▼

Display Time Unit: Milliseconds [ms] ▼

Display Energy Unit: Kilojoules [kJ] ▼

Display Displacement Unit: Millimetres [mm] ▼

Dummy Parts: 1423 PARTs selected ▶

Head History Node (Global): ted-Kinematics_Node_Global ▶

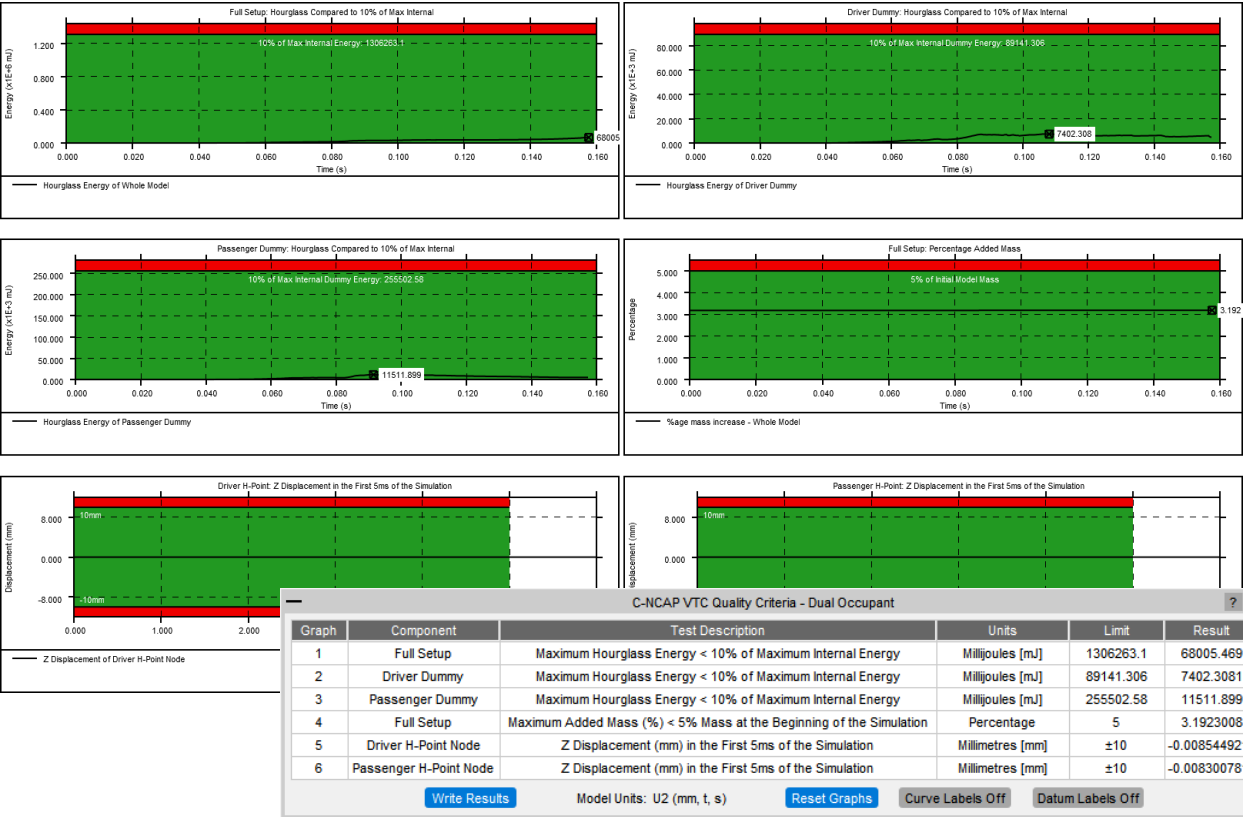
H-point History Node: e-History-Node_Node_Global ▶

B-pillar History Node: B-Pillar-accelerometer: 1 ▶

[Save To File](#) [Save To Model](#)

Quality Criteria: C-NCAP Occupant to Occupant (Dual Occupant)

- The C-NCAP Occupant to Occupant tool and associated REPORTER Template allow you to perform the quality checks required by the C-NCAP Far Side Occupant to Occupant Official Template, outlined in appendix H1.1.(f) of the C-NCAP 2024 Management Regulation relating to energy, added mass and displacements.



C-NCAP VTC Quality Criteria

Load Case

O2O (dual occupant)

Model Unit System

U2 (mm, t, s)

Display Time Unit

Seconds [s]

Display Energy Unit

Millijoules [mJ]

Driver Dummy Parts

918 PARTs selected

Driver H-pt History Node

10056

Passenger Dummy Parts

918 PARTs selected

Passenger H-pt History Node

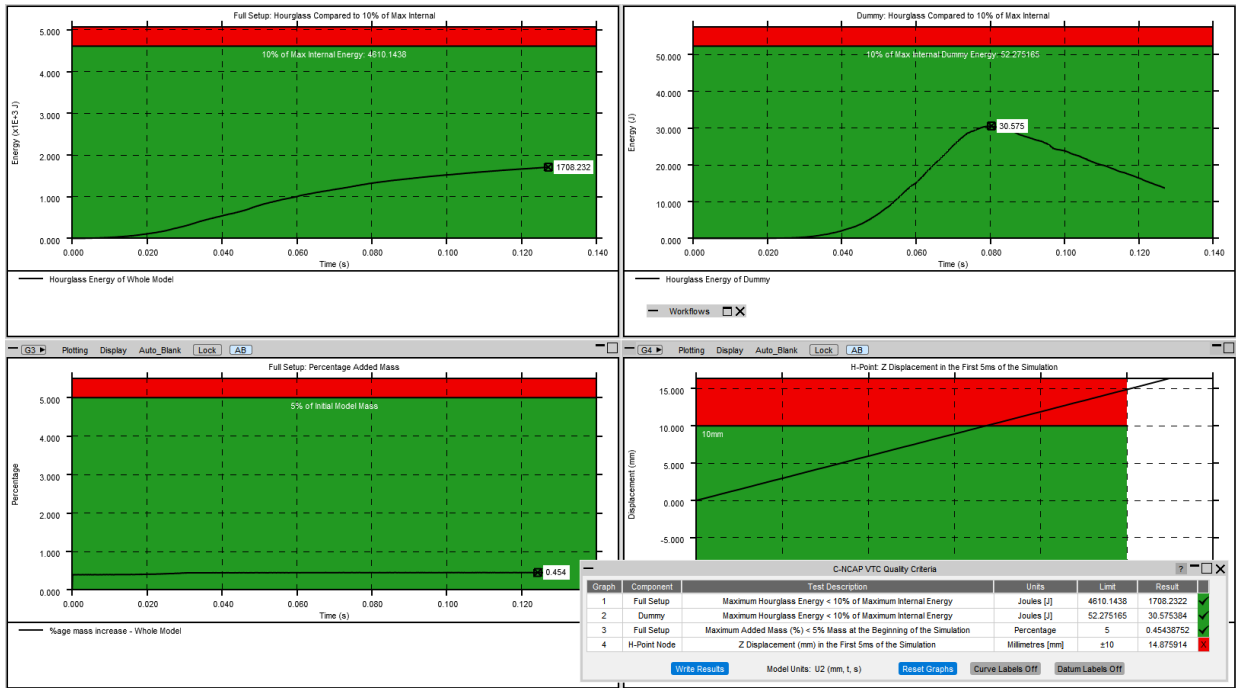
92010056

Save To File

Save To Model

Quality Criteria: C-NCAP Front AEB OOP 2024

- A new load case “Front AEB OOP” is added to the C-NCAP VTC Quality Criteria tool. Fill in and save user data, then output the report in REPORTER, or view results interactively in T/HIS.



C-NCAP VTC Quality Criteria

Load Case

Front AEB OOP

Model Unit System

U2 (mm, t, s)

Display Time Unit

Seconds [s]

Display Energy Unit

Millijoules [mJ]

Dummy Parts

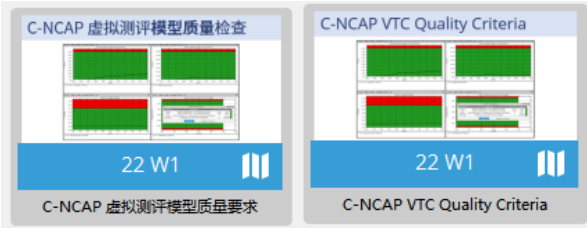
687 PARTs selected

H-point History Node

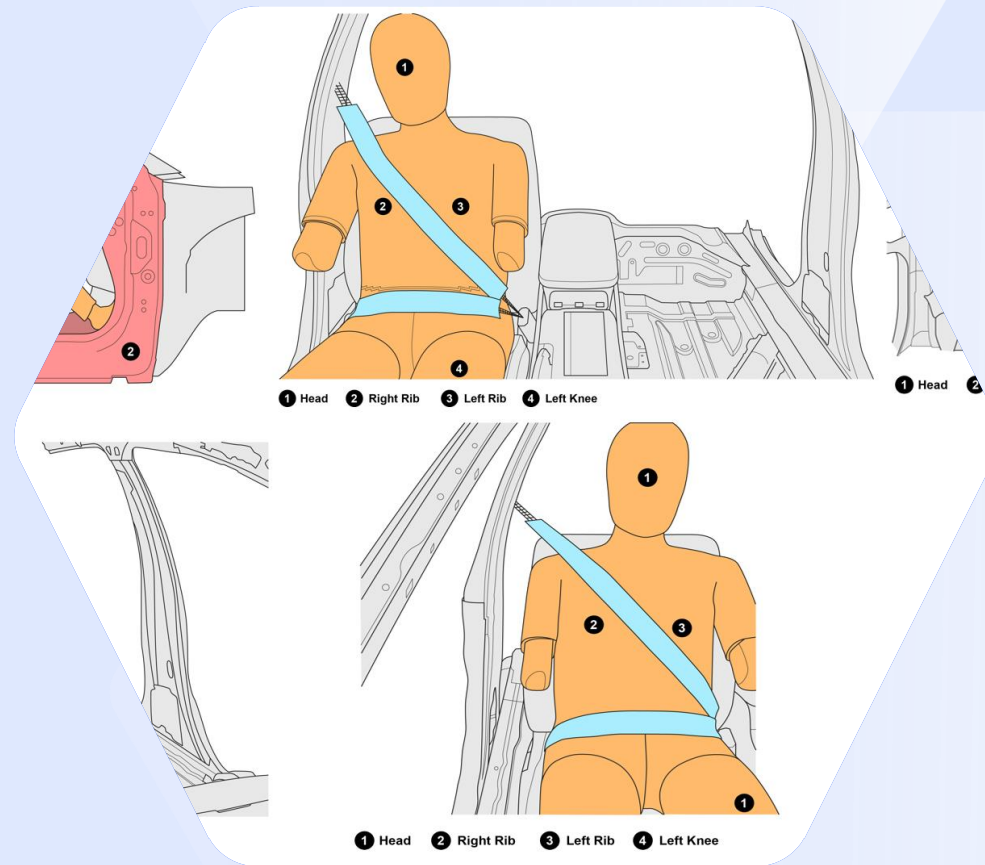
01PELV0000H3AC0

Save To File

Save To Model



VTC Videos Workflows



VTC Videos Updates in PRIMER

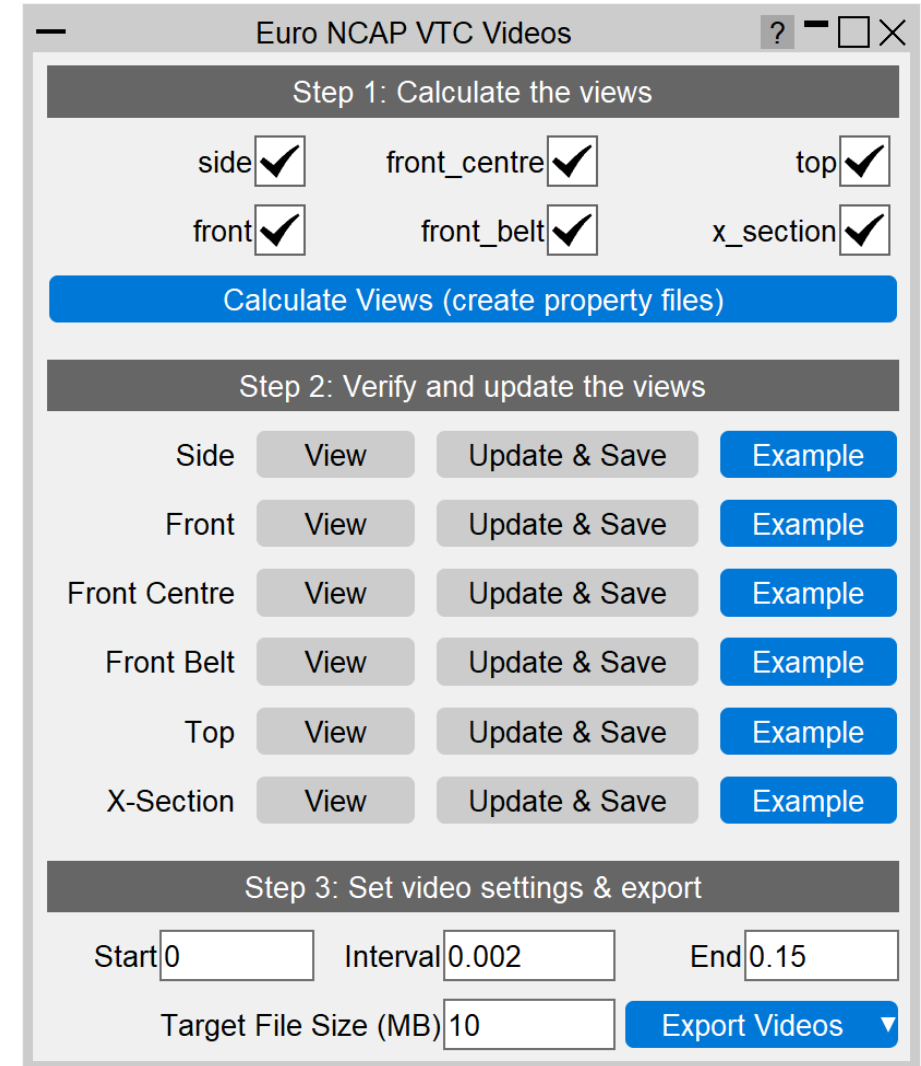
- VTC Videos are now combined into one Workflow, rather than having separate Workflows for each protocol.
- Inputs required for Euro NCAP Far Side have been significantly reduced
- Three shift deform nodes have been re-introduced as an option alongside using 1 shift deform node

The screenshot shows the 'Euro NCAP Far Side' configuration window. It contains the following fields and controls:

- Protocol:** A dropdown menu set to 'Euro NCAP Far Side'.
- Reference ID:** A dropdown menu set to 'FS_Pole_75_x-ref_z-ref_50M_Sim_1' and an empty text input field below it.
- Unit System:** A dropdown menu set to 'None'.
- *DATABASE_BINARY_D3PLOT DT:** A text input field followed by a blue 'Save DT' button.
- Head Node:** A text input field with a right-pointing arrow.
- Dummy Parts:** A text input field with a right-pointing arrow.
- Fixed Reference Node 1 (required):** A text input field followed by a 'Select...' button.
- Fixed Reference Node 2 (optional):** A text input field followed by a 'Select...' button.
- Fixed Reference Node 3 (optional):** A text input field followed by a 'Select...' button.
- Parts to Blank:** A text input field with a right-pointing arrow.
- Property Files Directory:** A text input field followed by a folder icon button.
- Side Selection:** Two radio buttons labeled 'LHD' and 'RHD'.
- Buttons:** A large grey button with a question mark '?' and two smaller grey buttons labeled 'Save To File' and 'Save To Model' at the bottom right.

VTC Videos Updates in POST

- The 'Step 2' section of the GUI has been redesigned for simplification adding an example button for each view.
- In 'Step 3', the displayed End time is now determined by model simulation end time rounded down to three decimal places rather than model simulation end time minus 1 interval step (which had caused issues with video capture previously).
- In 'Step 3', For the Euro NCAP versions, the Video Quality slider has been replaced with a target file size option to allow users to satisfy the 1-10 MB video requirement.
- REPORTER will now use the specified property files save directory from the Workflow data, rather than the REPORTER Template output directory.



The screenshot displays the 'Euro NCAP VTC Videos' application window, which is organized into three sequential steps:

- Step 1: Calculate the views**
 - Views to calculate are selected via checkboxes: side, front, front_centre, front_belt, top, and x_section. All are currently checked.
 - A blue button labeled 'Calculate Views (create property files)' is located below the checkboxes.
- Step 2: Verify and update the views**
 - This section contains a table of view controls:

View	View	Update & Save	Example
Side	<input type="button" value="View"/>	<input type="button" value="Update & Save"/>	<input type="button" value="Example"/>
Front	<input type="button" value="View"/>	<input type="button" value="Update & Save"/>	<input type="button" value="Example"/>
Front Centre	<input type="button" value="View"/>	<input type="button" value="Update & Save"/>	<input type="button" value="Example"/>
Front Belt	<input type="button" value="View"/>	<input type="button" value="Update & Save"/>	<input type="button" value="Example"/>
Top	<input type="button" value="View"/>	<input type="button" value="Update & Save"/>	<input type="button" value="Example"/>
X-Section	<input type="button" value="View"/>	<input type="button" value="Update & Save"/>	<input type="button" value="Example"/>
- Step 3: Set video settings & export**
 - Input fields for 'Start' (0), 'Interval' (0.002), and 'End' (0.15) are provided.
 - A 'Target File Size (MB)' field is set to 10.
 - A blue button labeled 'Export Videos' with a dropdown arrow is at the bottom right.

VTC Videos new protocol: C-NCAP Occupant to Occupant

- The C-NCAP Occupant to Occupant tool and associated REPORTER Template allow you to create the images required by the C-NCAP Far Side Occupant to Occupant Official Template to show the minimum distance between the far side head and the near side head.

Step 1: Calculate the views

Front ☒ Top ☒

Calculate Views (create property files)

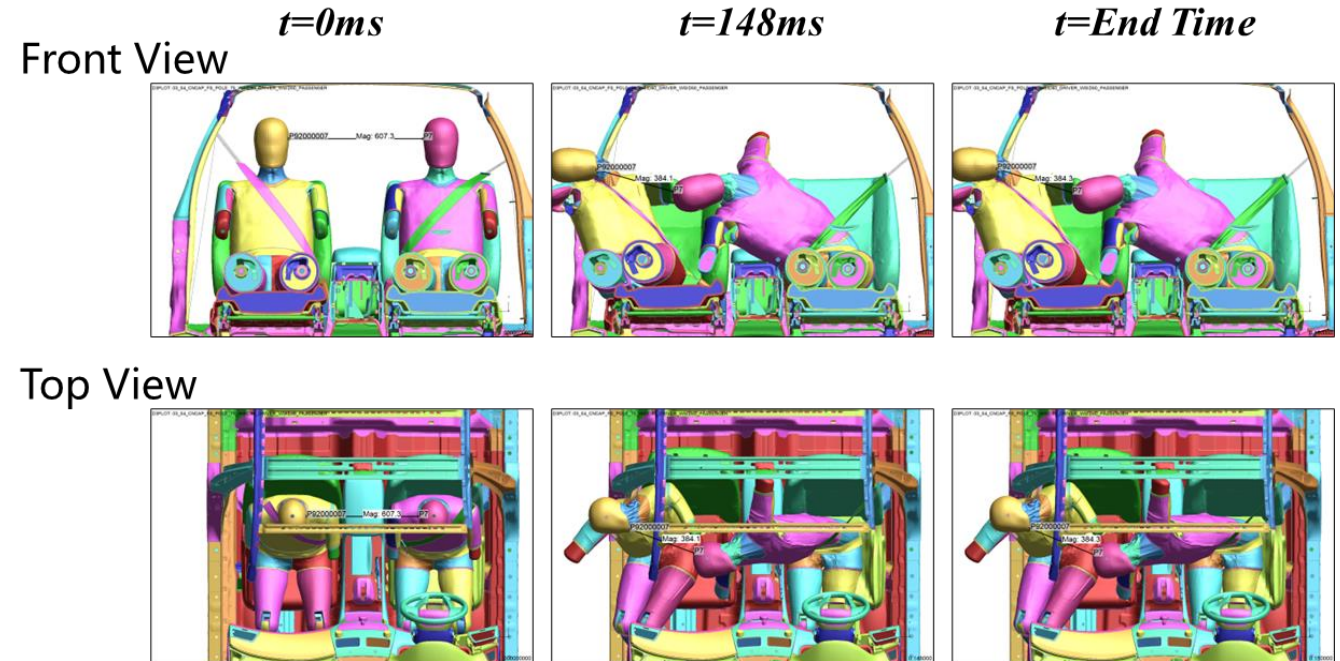
Step 2: View, Verify and update the views (Hover for help)

View Front Update & Save front view and Cut section

View Top Only update & save top view property

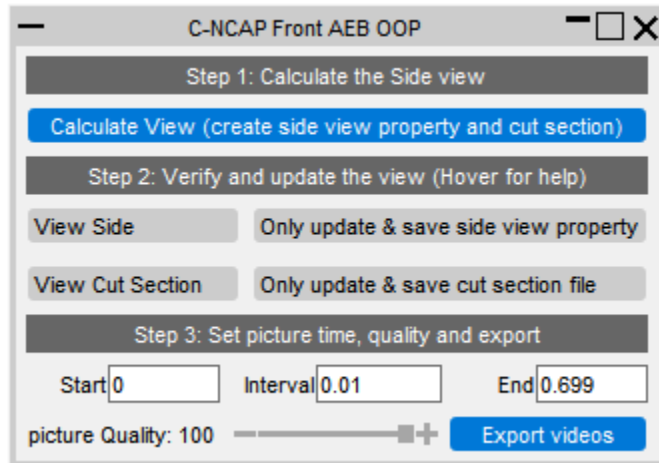
Step 3: Export the Picture

Export pictures



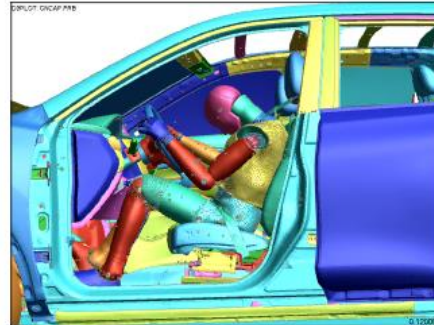
VTC Videos new protocol: C-NCAP Front AEB OOP

- The C-NCAP Front AEB OOP tool and associated REPORTER Template allow you to create the images required by the C-NCAP 2024 Frontal VTC Official Template to show the required 3 views for all models used for this protocol.

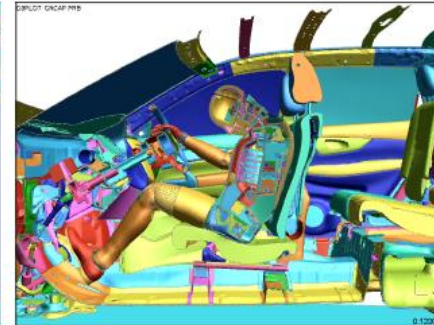


Videos for
FRB / MPDB

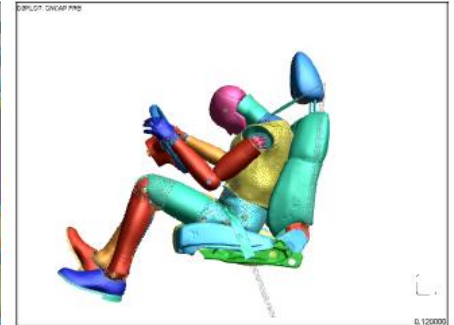
Side View



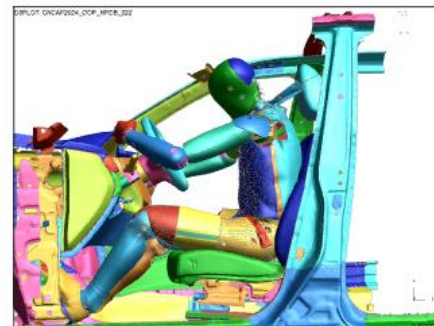
H-point Cut Section View



Dummy, Seatbelt and
Seat only



Side View



H-point Cut Section View



Dummy, Seatbelt and
Seat only



Videos for
OOP + FRB /
OOP + MPDB

Workflows

Pulse Index Workflow (PI)

- The Pulse Index workflow allows you to estimate the acceleration that would be experienced by a vehicle occupant in a crash test scenario. The following improvements have been made:
 - The occupant mass input has been removed with stiffness now being taken per unit mass.
 - Based on the stiffness input, time period of the system is now displayed to serve as a sense check.
 - The acceleration curve filter can now be chosen from three options: C60, C180, and C600.
 - A differentiated velocity curve can now be used in place of the acceleration curve.



Model	
Units:	U1 (m, kg, s) ▼
Parameters	
Initial velocity (m/s):	15.6
Restraint stiffness (per unit mass): (N/m/kg)	<input checked="" type="radio"/> Constant 2000 <input type="radio"/> Variable Select curve T: 0.1405 s
Slack (m):	0
Measurement node:	X-Axis ▼
Display Units	
Time Units:	Seconds [s] ▼
Acceleration Units:	<input checked="" type="radio"/> g <input type="radio"/> Display Units
Displacement Units:	Metres [m] ▼
Acceleration Filter:	C60 ▼
Read Velocity:	<input type="checkbox"/>
Save to file Save to model	

Stiffness now per unit mass

Time period relating to current stiffness

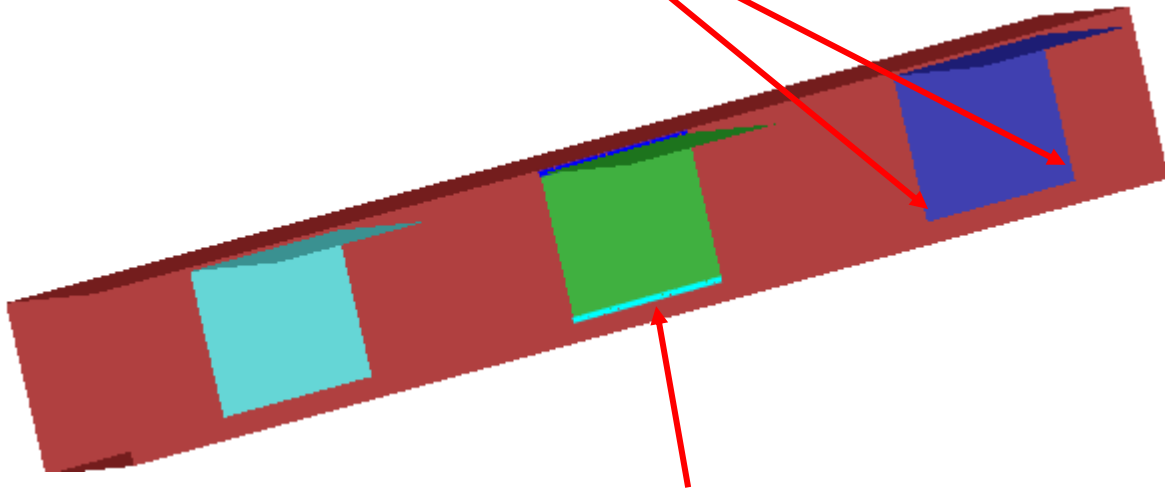
Take acceleration as a differentiated velocity curve

Select filter applied to the acceleration curve

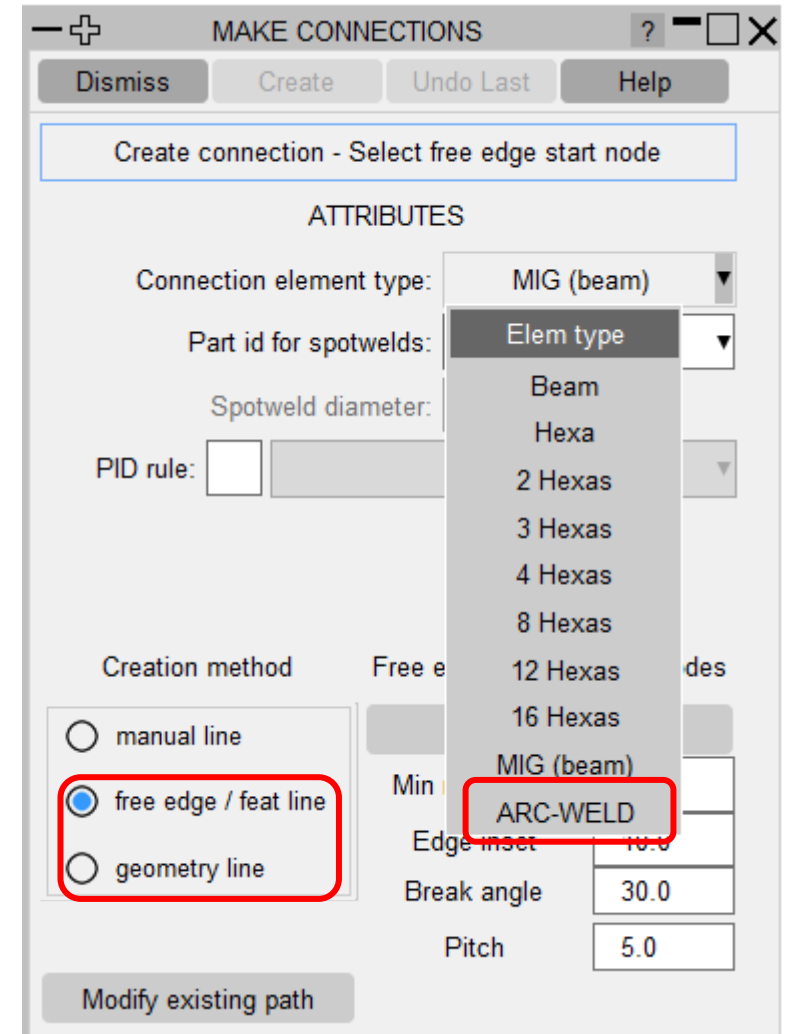
Connections Enhancements

New spotweld line connection: ARC-WELD (contact)

- This new connection type creates contact connection on free edges or feature lines.
 - Defined directly by 2 node picks.

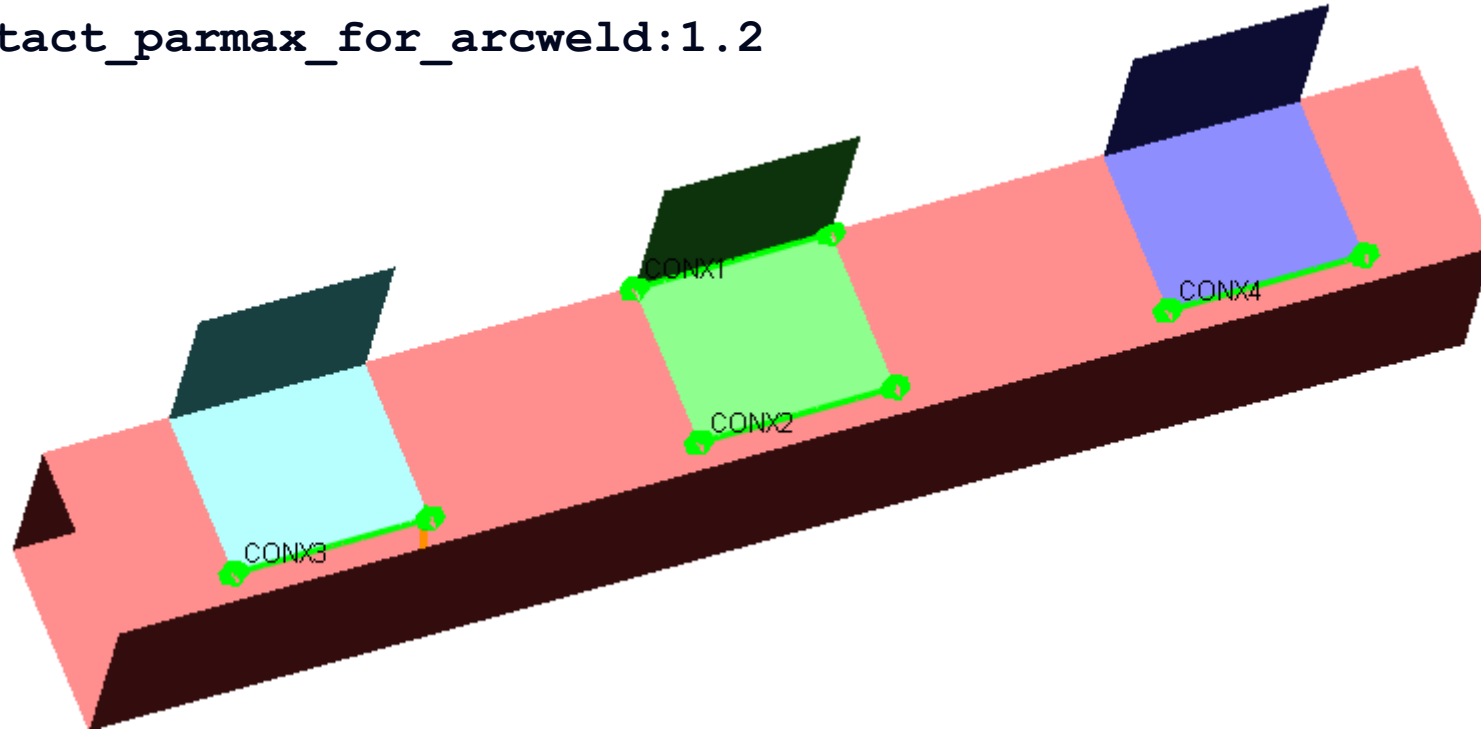


- Or by selection of 1 or more IGES curves.
- The IGES curves may exist in another model.



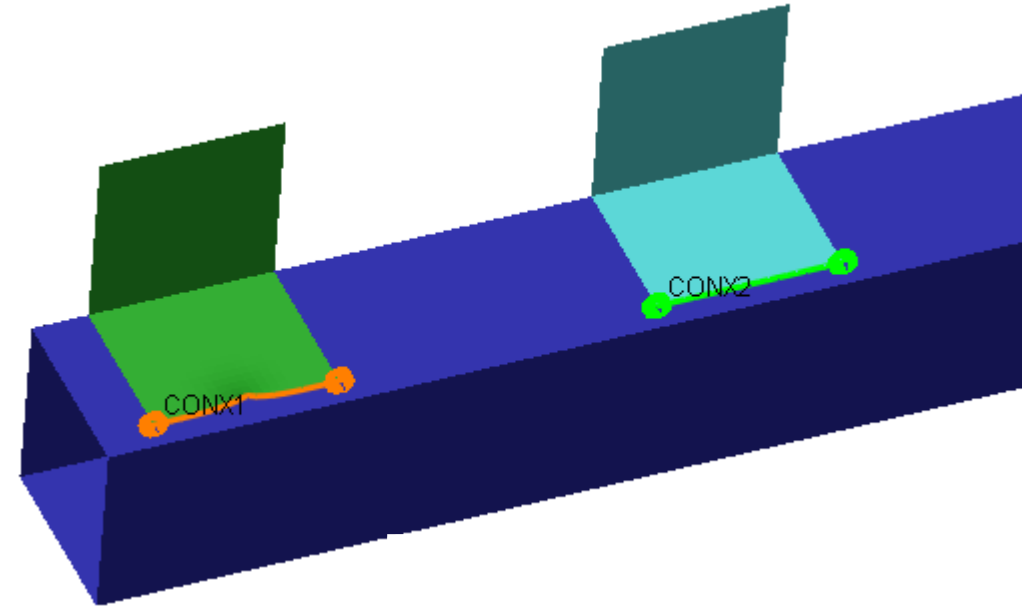
New spotweld line connection: ARC-WELD (contact)

- Each ARC-WELD connection “owns” a TIED_SHELL_EDGE_TO_SURFACE_CONTACT
- Contact thickness SAST, SBST set to maximum calculated from nodal projection
- PARMAX increased to user limit (if necessary to tie nodes)
- `primer*max_contact_parmax_for_arcweld:1.2`



New spotweld line connection: ARC-WELD (contact)

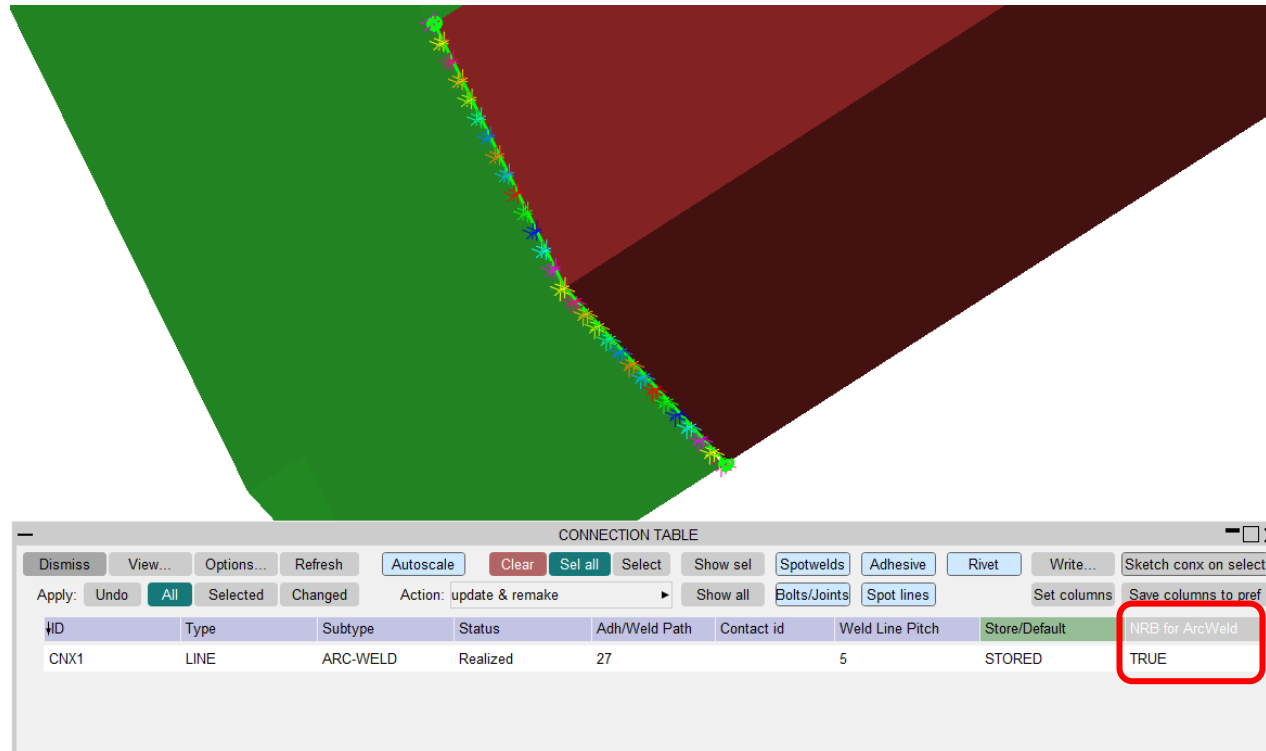
- The connection status is REALIZED if all nodes tie.
- The connection status is INVALID if any nodes fail to tie.
- Easy to identify weld failures on connection table.



CONNECTION TABLE							
Dismiss View... Options... Refresh Action: update & remake Show all Spotwelds Adhesive Rivet Write... Sketch conx on select ?							
Apply: Undo All Selected Changed Autoscale Clear Sel all Select Show sel Bolts/Joints Spot lines Set columns Save columns to pref							
ID	Type	Subtype	Status	Error	Details	Contact id	
CNX1	LINE	ARC-WELD	Invalid	ARCWELD CONTACT FAIL - failed to tie all tracked node	9/21 nodes untied. sfst=2.00 sfmt=2.00	C1	
CNX2	LINE	ARC-WELD	Realized			C2	

New spotweld line connection: ARC-WELD (NRB)

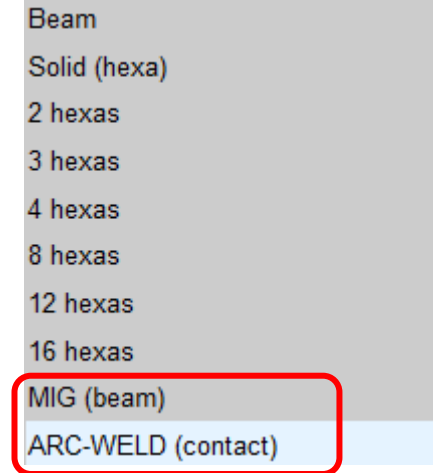
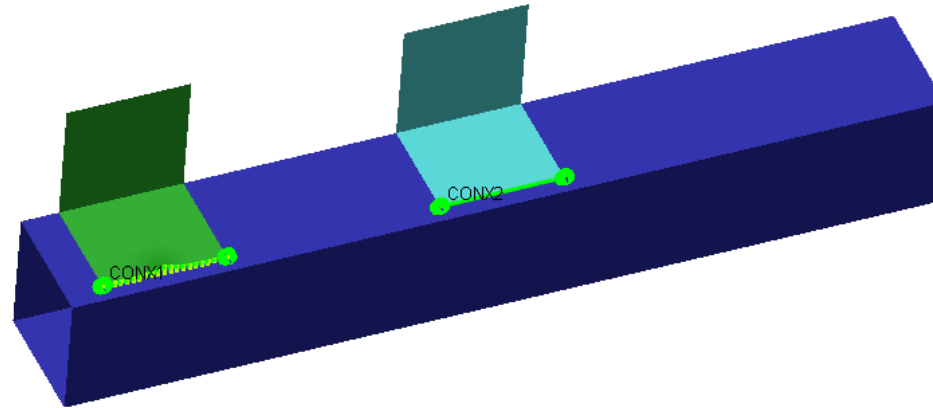
- ARC-WELDs can be easily converted from tied contacts to multiple NRBs.
- The default for newly created Arc-Welds can be set using the connection option: “Use NRBs for Arc-Weld”.
- Alternatively existing welds can be remade using the saved setting on the connection table “NRB for Arc-Weld” to switch between contact and NRB.



<input checked="" type="checkbox"/>	Use NRBs for Arc-Weld
Feature line angle for MIG/ARC welds	60.0
Spotweld line edge search dist	15.0
Max contact parmax for ARC welds	1.2

New spotweld line connection: ARC-WELD vs MIG (beam)

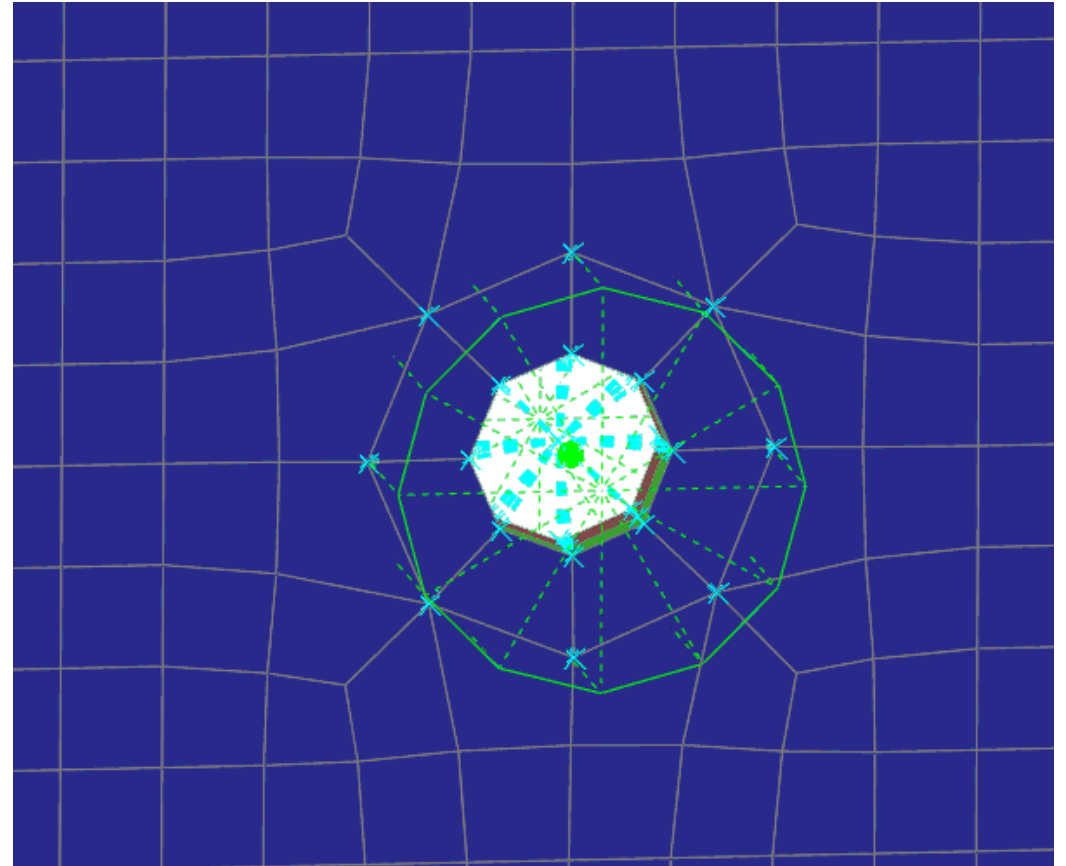
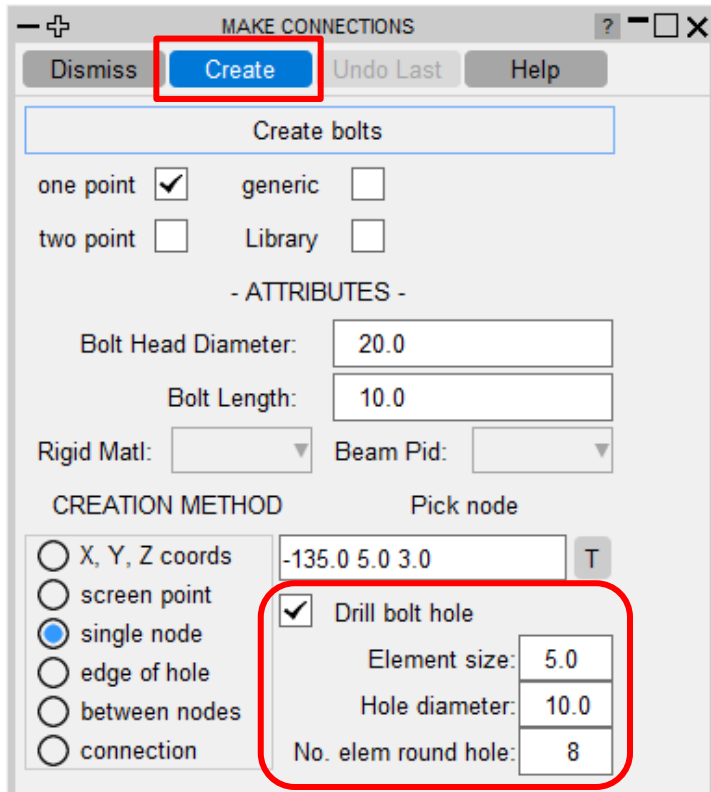
- ARC-WELDs can be converted to MIG (beam) via the connection table.
- Existing MIG (beam) welds can also be converted to ARC-WELDs.



CONNECTION TABLE							
Dismiss		View...	Options...	Refresh	Action: update & remake		Show all
Apply: Undo		All	Selected	Changed	Autoscale	Clear	Sel all
		Select	Show sel	Spotwelds	Adhesive	Rivet	Write...
		Sketch conx on select	?	Boilts/Joints	Spot lines	Set columns	Save columns to pref
ID	Type	Subtype	Status	Error	Details	Contact id	Part ID
CNX1	LINE	MIG (beam)	Realized			C1	100
CNX2	LINE	ARC-WELD	Realized			C2	<n/a>

Connections – bolt hole drilling

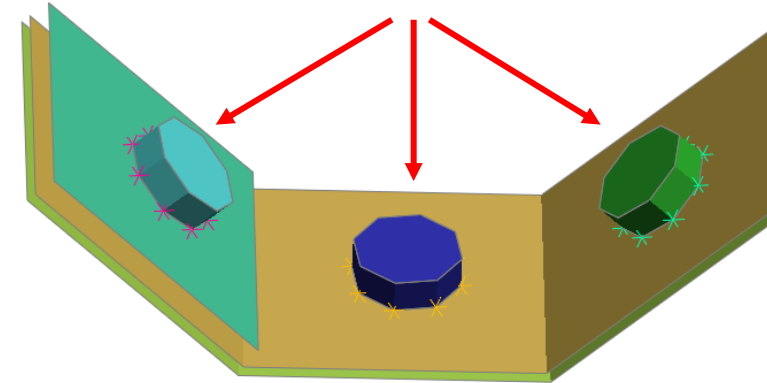
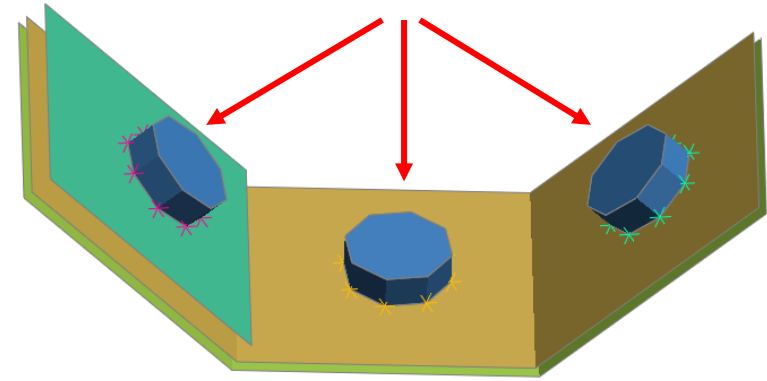
- The Connections creation panel can now, optionally, also drill bolt holes as a part of bolt creation.
- This new option is currently only supported for single point, cylindrical nodal rigid body type bolts.



Connections – modular bolt part

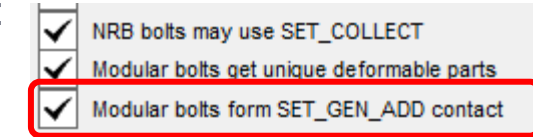
- The default is to use same part for deformable elements when making multiple bolts, e.g. all bolt heads in same part.
- There is now a new option to use unique parts for deformable elements of modular bolts (same as treatment of rigid elements), e.g. unique part for each bolt head.

<input checked="" type="checkbox"/>	Simplify merge bolt
<input checked="" type="checkbox"/>	NRB bolt attaches to existing nrbs
<input checked="" type="checkbox"/>	NRB bolts may use SET_COLLECT
<input checked="" type="checkbox"/>	Modular bolts get unique deformable parts
<input type="checkbox"/>	Modular bolts form SET_GEN_ADD contact

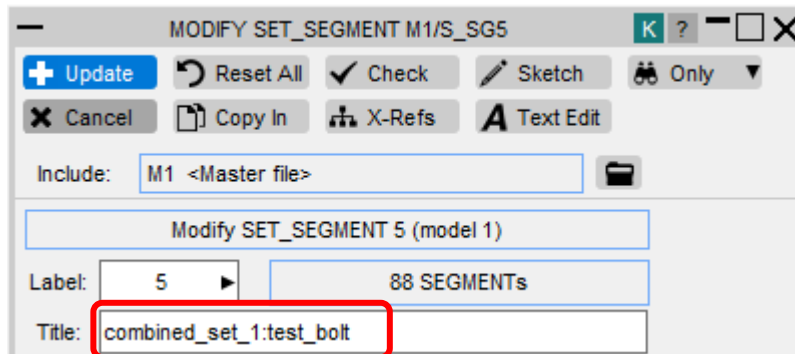


Connections – modular bolt contact

- The new feature described here applies when working with connection bolt modules containing ***SET_SEGMENT_GENERAL** which typically will use ***DEFINE_CONTACT_VOLUME**.
- The following new bolt connection option will automatically create contacts:
 - ☒ NRB bolts may use SET_COLLECT
 - ☒ Modular bolts get unique deformable parts
 - ☒ Modular bolts form SET_GEN_ADD contact
- On bolt creation ***CONTACT** is created with ***SET_SEGMENT_ADD** containing multiple ***SET_SEGMENT_GENERAL**.
- All bolts of same module will have the ***CONTACT**.
- The ***SET_SEGMENT_ADD** title references the module name.



☒ NRB bolts may use SET_COLLECT
☒ Modular bolts get unique deformable parts
☒ Modular bolts form SET_GEN_ADD contact



MODIFY SET_SEGMENT M1/S_SG5

+ Update Reset All Check Sketch Only

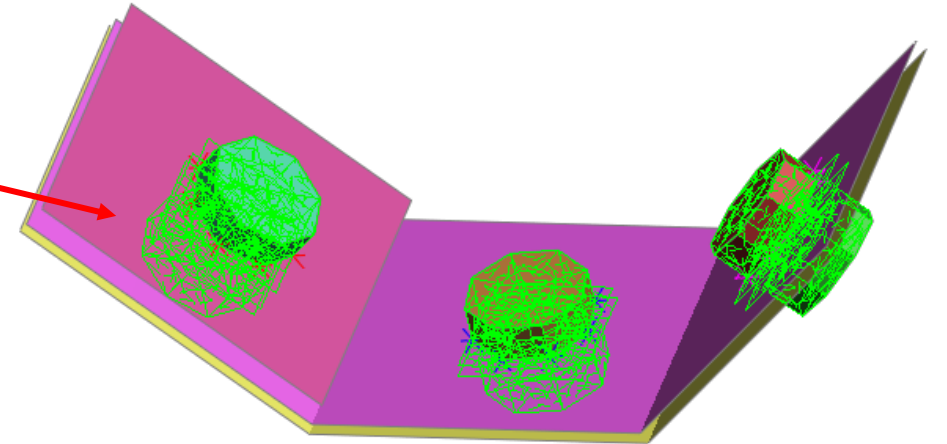
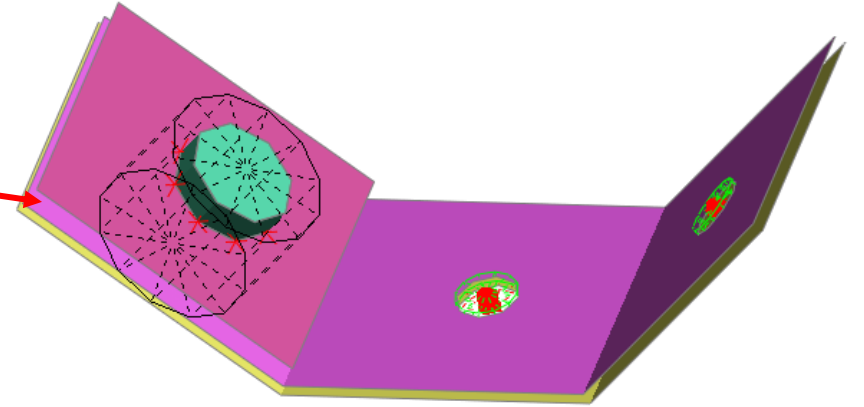
X Cancel Copy In X-Refs Text Edit

Include: M1 <Master file>

Modify SET_SEGMENT 5 (model 1)

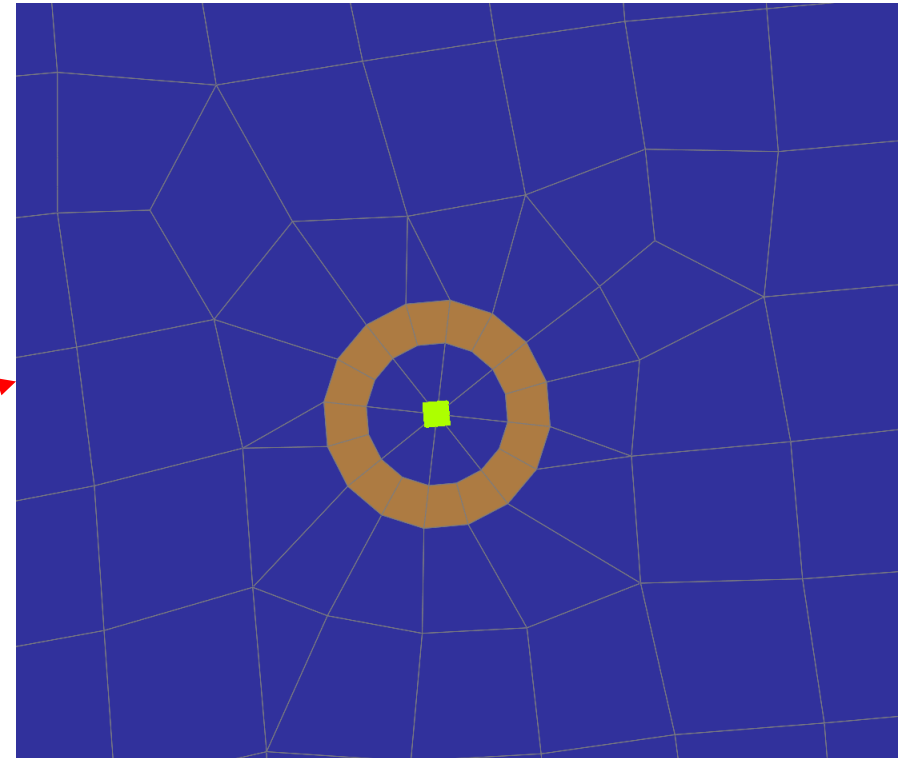
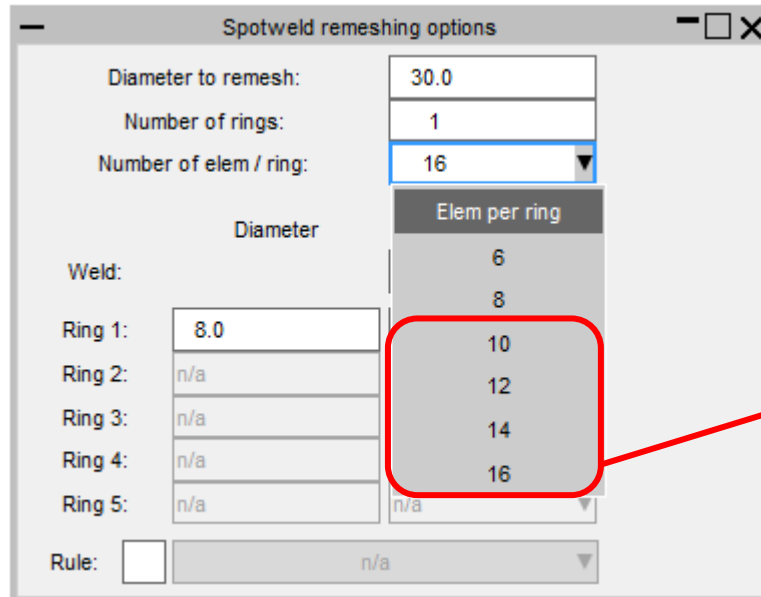
Label: 5 88 SEGMENTS

Title: combined_set_1:test_bolt



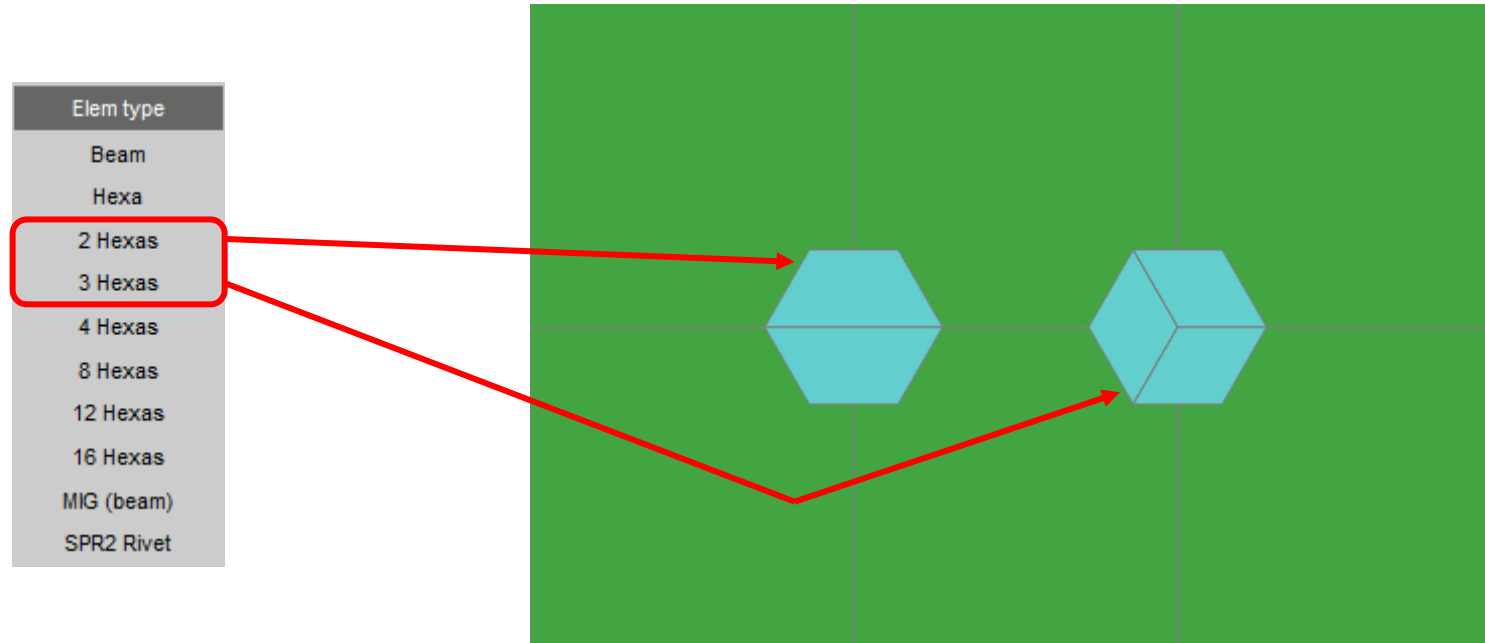
HAZ – options for increased number of elements per ring

- Beam welds previously supported either 6 or 8 elements/ring in the heat-affected zone.
- Options have now been added for 10, 12, 14 and 16 elements per ring giving more flexibility when creating connections.



Solid spotwelds – new nugget types

- New solid spotweld types 2-hexa and 3-hexa have been added.



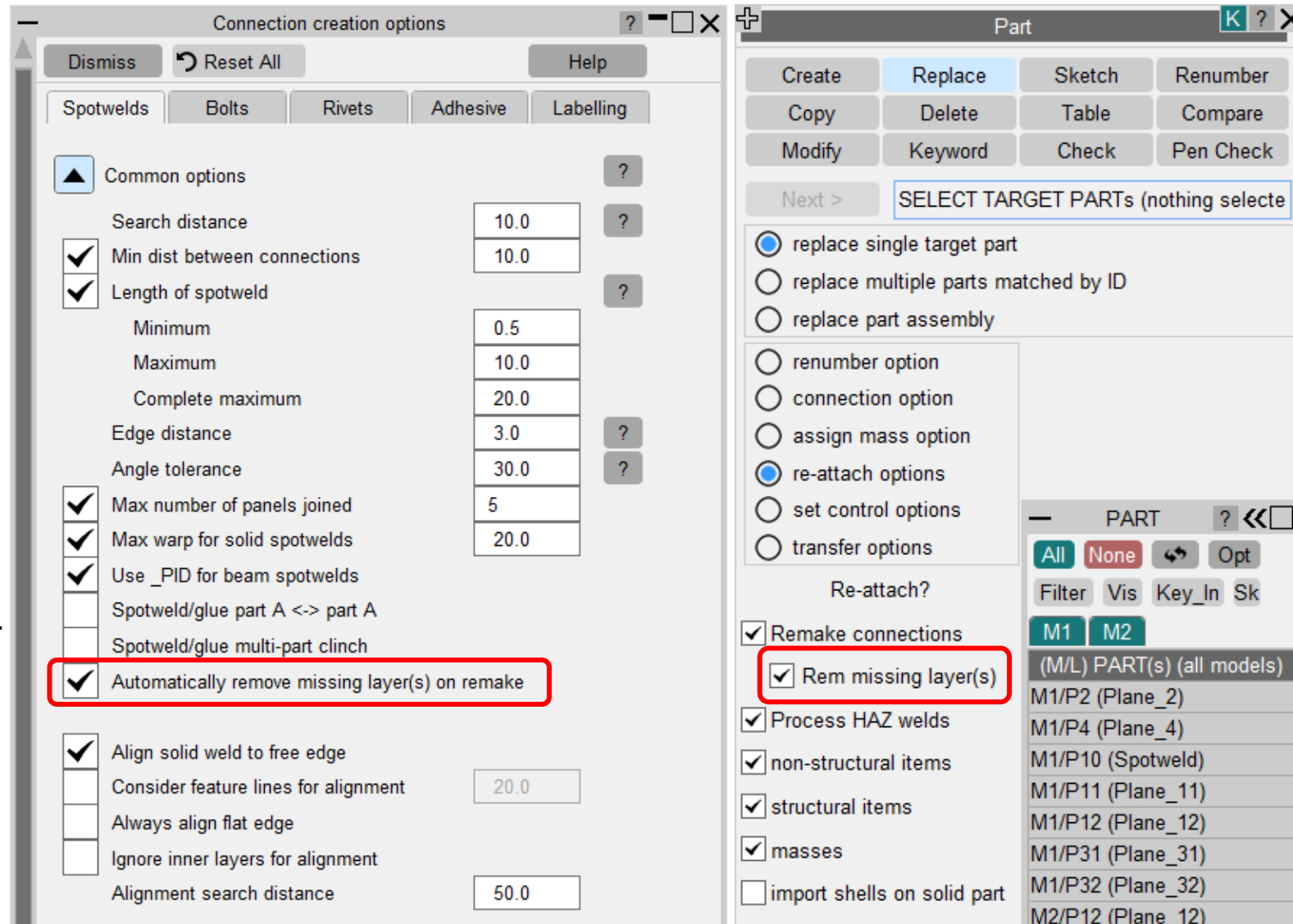
Connections – spotweld_remake_auto_remove_layer

- There is now a new preference:

spotweld_remake_auto_remove_layer

When it is TRUE, PRIMER will automatically remove layers that failed to connect when remaking spotwelds.

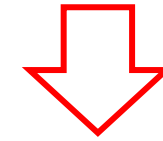
- This option is also available on the panels as shown.
- For example, when doing part replace PRIMER now automatically converts 3-layer spotwelds to a 2-layer ones where appropriate instead of having to convert manually afterwards via the connection table.



Connections Compare – Filter options

- The connection compare feature allows users to compare connections across models or with connection files.
- In previous versions, we can filter the connections by visible domain by toggling the “Set domain from visible elements” option on.
- For PRIMER 22.0, we have added the functionality to filter connection by PARTs

☒ Set domain from visible elements



Filter options

☐ all connections

☒ visible domain

☐ by layer panels

☐ by attached panels

Connections – UI improvements

- The Connections creation panel and the Connections Table both see some user-interface improvements including the renaming of controls and the rearrangement of menu layouts to make them more intuitive.

MAKE CONNECTIONS

Dismiss Create Undo Last Help

Create spotwelds/Rivets

ATTRIBUTES

Connection element type: Beam

Part id for spotwelds: 3

Spotweld diameter: 5.0

Remesh: ☒ Remesh Options

PID rule: ☐ n/a

Creation method

Pick screen point

☐ X, Y, Z coords

☒ pick screen point

☐ pick single node

☐ all nodes in set

☐ line of welds/rivets

☐ pick connection

☐ auto weld

☐ pick geom point

CONNECTION TABLE

Dismiss View... Options... Refresh Autoscale Clear Sel all Select Show sel

Apply: Undo All Selected Changed Action: update & remake Show all

Spotwelds Adhesive

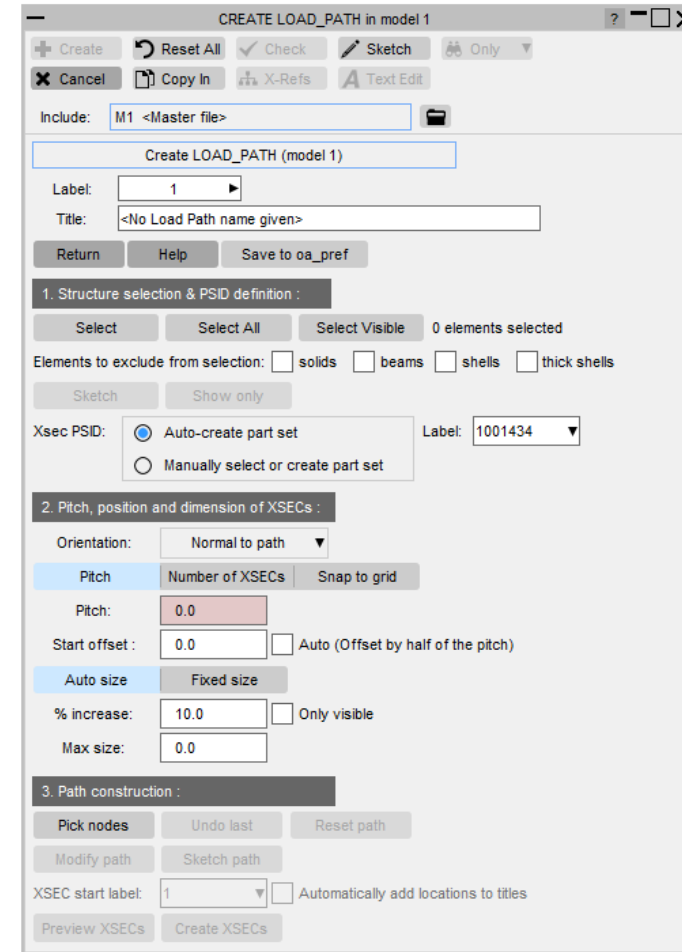
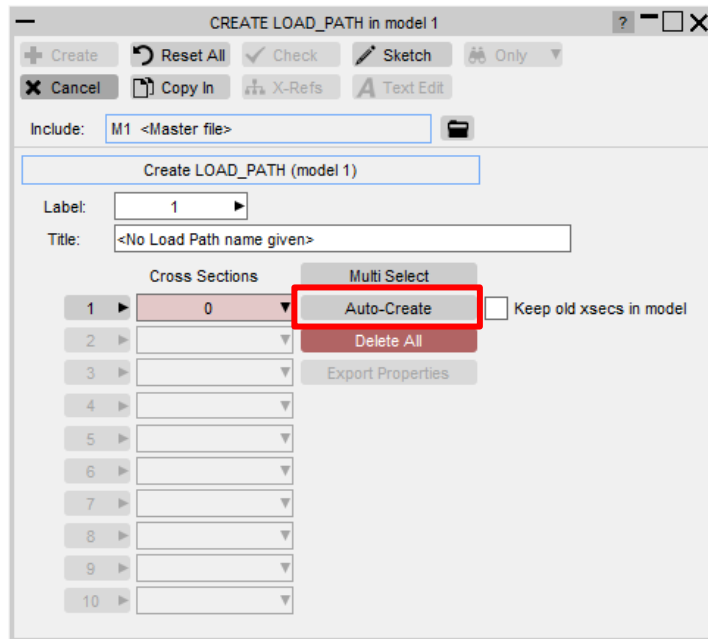
Bolts/Joints Spot lines

ID	Type	Subtype	Status	Error	Details	Part ID	Contact id
M2/CNX2	SPOTWELD	2 hexas	Realized			4	C1
M2/CNX3	SPOTWELD	3 hexas	Realized			4	C1

Load Path Tool Enhancements

Auto-create cross sections

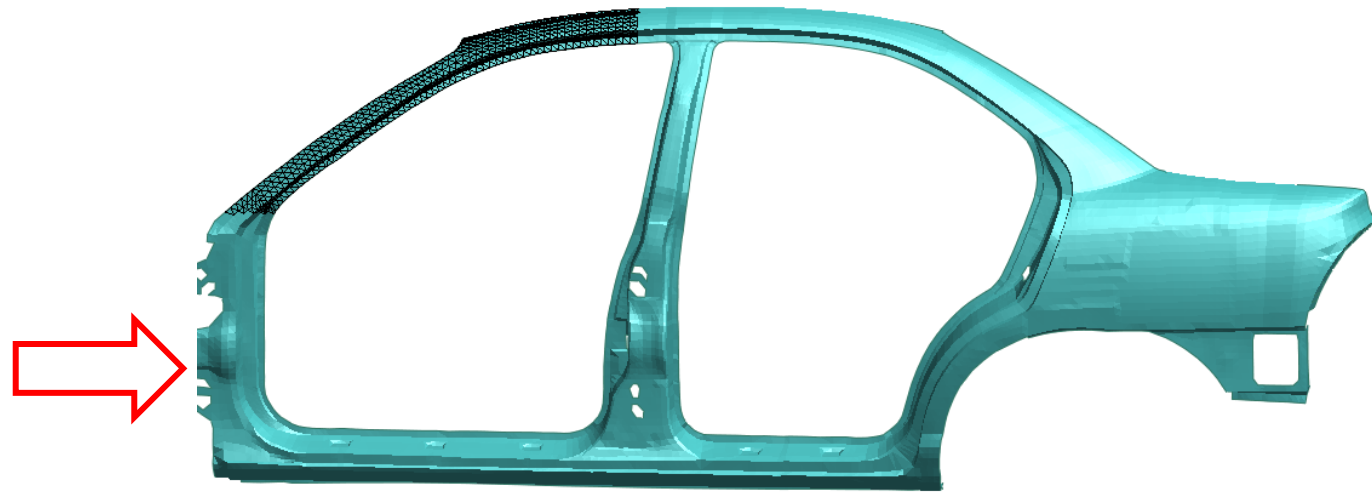
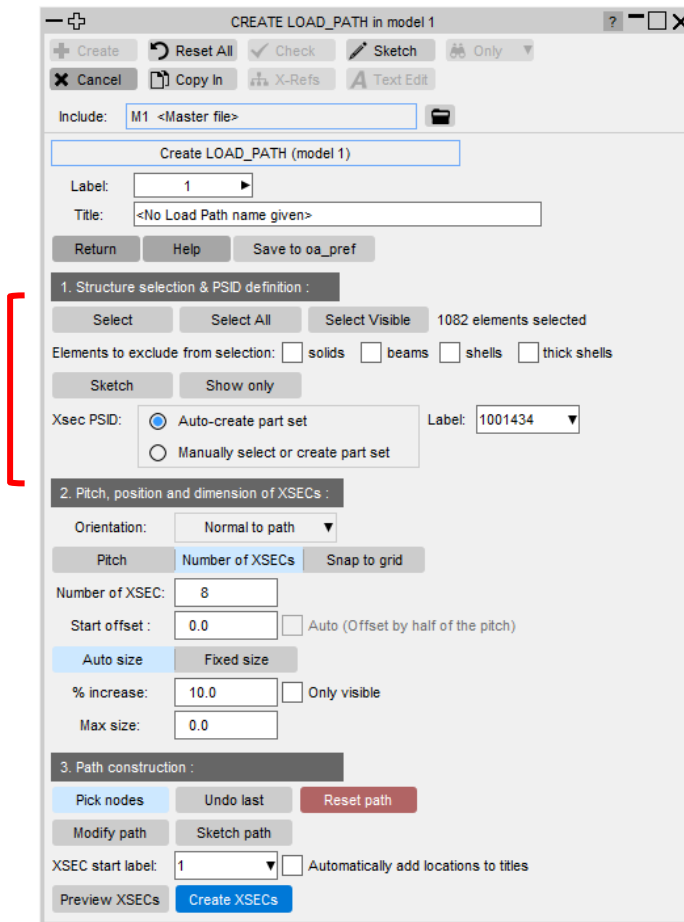
- Added the option to automatically create multiple cross sections through a desired structure.



Auto-create cross sections

- The process involves the following steps:

1. Select the desired structure and the PSID to be referenced by the ***DATABASE_CROSS_SECTIONS**.



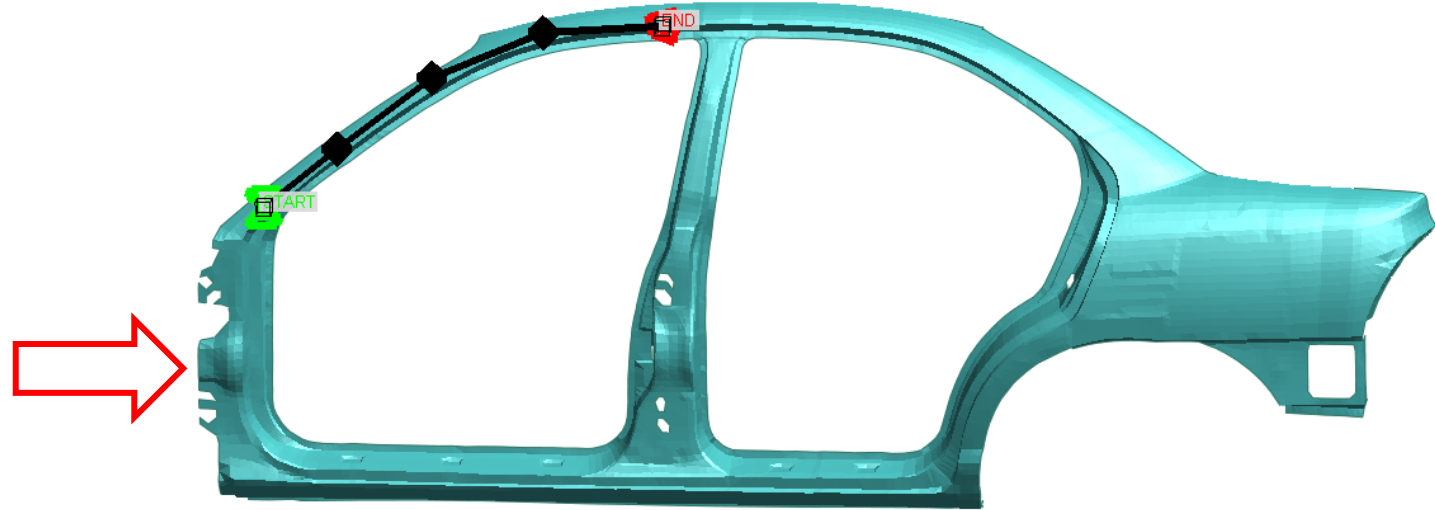
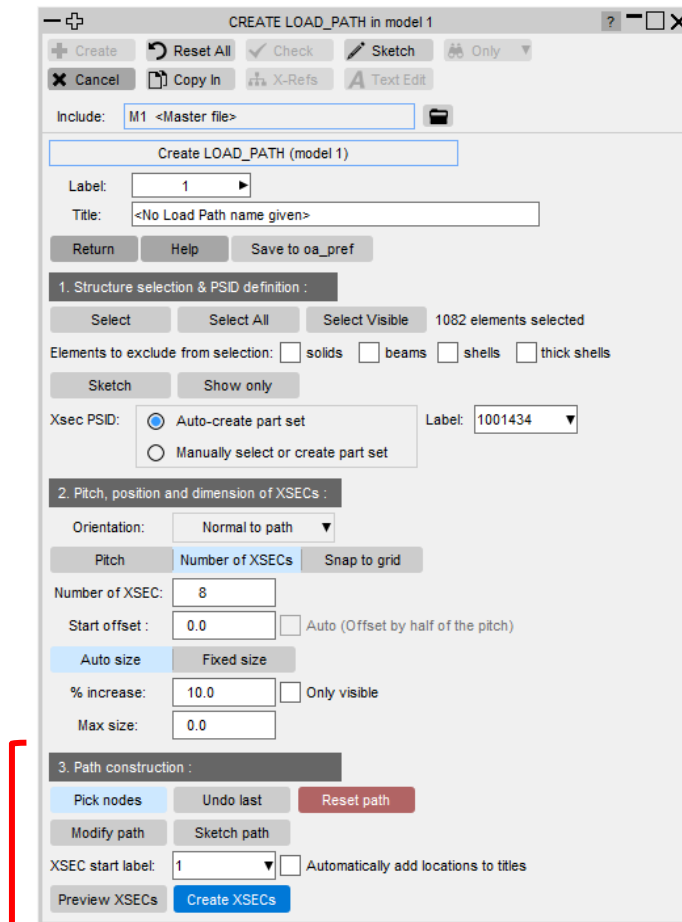
Auto-create cross sections

2. Define the pitch, position and dimensions of the cross sections.

The screenshot shows the 'CREATE LOAD_PATH' dialog box in LS-DYNA. The '2. Pitch, position and dimension of XSECs' section is highlighted with a red bracket. The dialog is titled 'CREATE LOAD_PATH in model 1' and includes a toolbar with buttons: Create, Reset All, Check, Sketch, Only, Cancel, Copy In, X-Refs, and Text Edit. The 'Include' field is set to 'M1 <Master file>'. The 'Create LOAD_PATH (model 1)' section has a 'Label' field set to '1' and a 'Title' field set to '<No Load Path name given>'. Below this are 'Return', 'Help', and 'Save to oa_pref' buttons. The '1. Structure selection & PSID definition' section has 'Select', 'Select All', and 'Select Visible' buttons, with '1082 elements selected'. It also has checkboxes for 'solids', 'beams', 'shells', and 'thick shells', and 'Sketch' and 'Show only' buttons. The 'Xsec PSID' section has radio buttons for 'Auto-create part set' (selected) and 'Manually select or create part set', with a 'Label' dropdown set to '1001434'. The '2. Pitch, position and dimension of XSECs' section has an 'Orientation' dropdown set to 'Normal to path', and tabs for 'Pitch', 'Number of XSECs', and 'Snap to grid'. The 'Number of XSEC' tab is active, showing 'Number of XSEC' set to '8', 'Start offset' set to '0.0', and an 'Auto (Offset by half of the pitch)' checkbox. It also has 'Auto size' and 'Fixed size' tabs, with 'Auto size' selected, and fields for '% increase' (10.0) and 'Max size' (0.0). The '3. Path construction' section has 'Pick nodes', 'Undo last', and 'Reset path' buttons, and 'Modify path' and 'Sketch path' buttons. It also has an 'XSEC start label' dropdown set to '1' and an 'Automatically add locations to titles' checkbox. At the bottom are 'Preview XSECs' and 'Create XSECs' buttons.

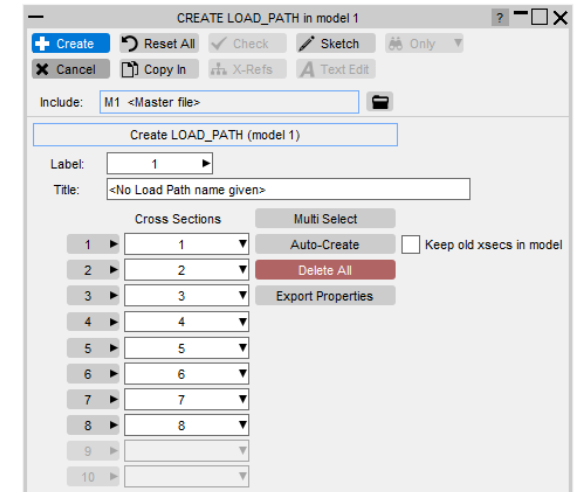
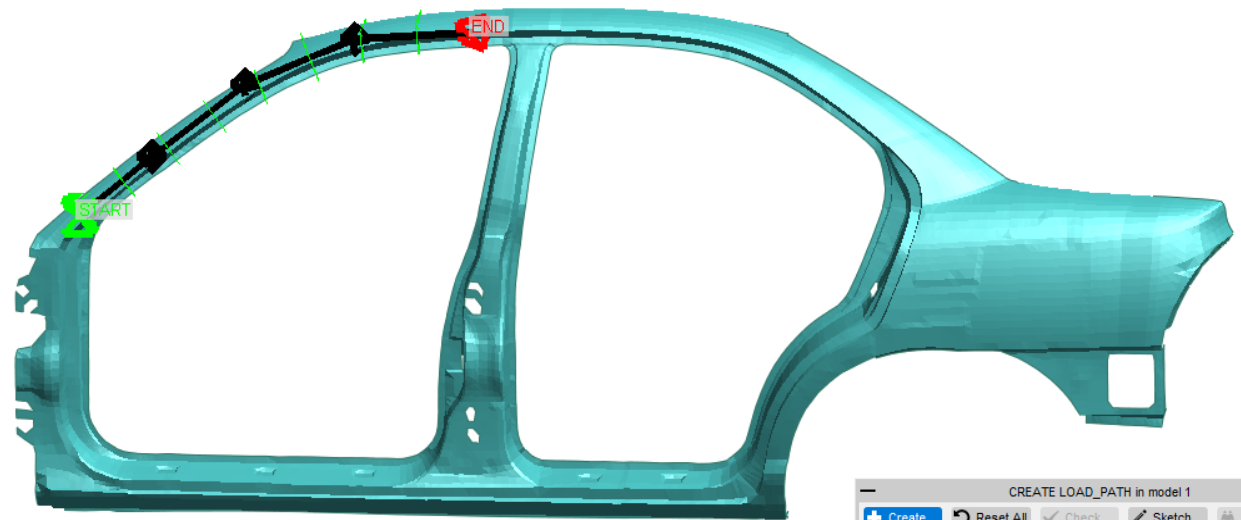
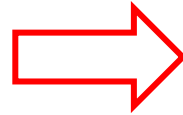
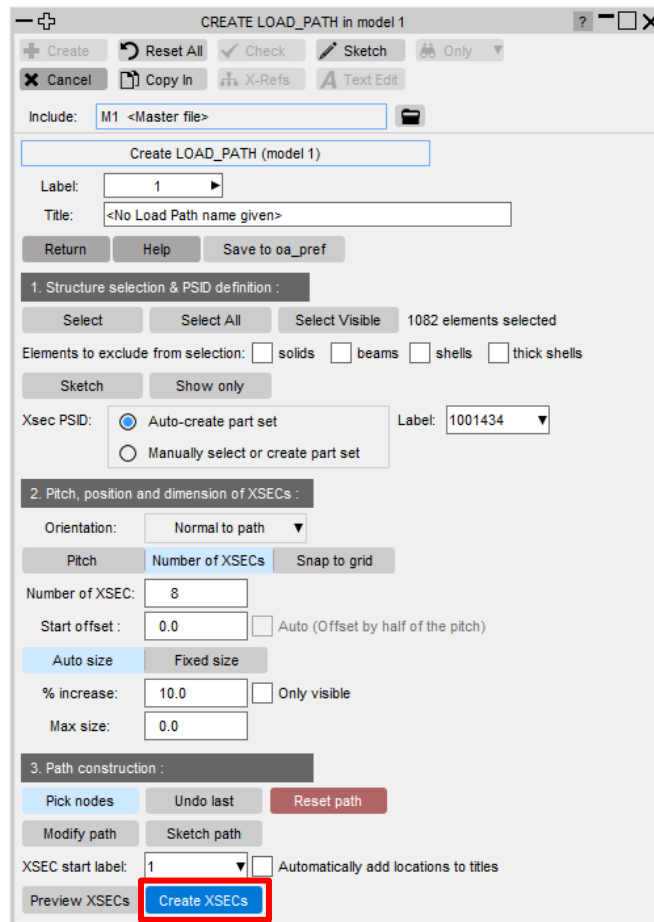
Auto-create cross sections

3. Define a path at the desired structure by picking at least 2 nodes.



Auto-create cross sections

- The ***DATABASE_CROSS_SECTION**s can then be created by PRIMER and the load path list in the main panel is automatically populated.



Saving 'auto-create' settings as preferences

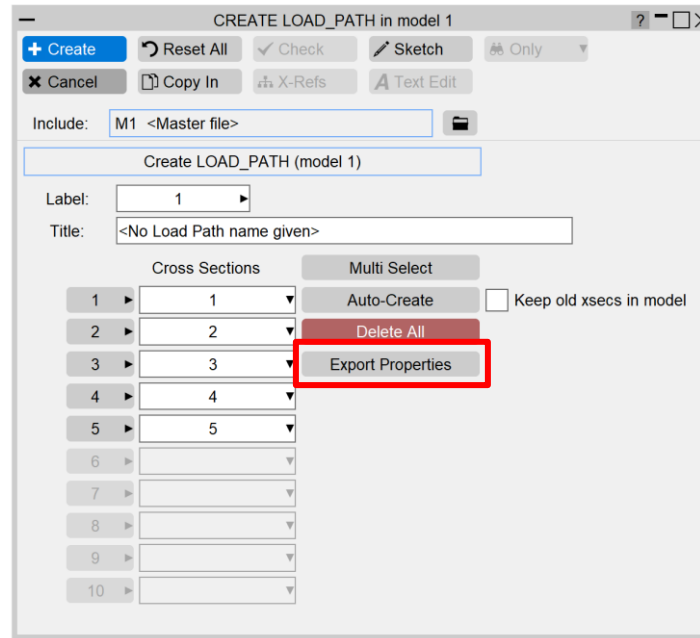
- All configuration settings (excluding entity selection and labelling) from the auto-create panel can be saved as preferences. Clicking on '**Save to oa_pref**' will save the values in the current session as defaults for future sessions of the load path auto-create panel.

The screenshot shows the 'CREATE LOAD_PATH in model 1' dialog box. The 'Save to oa_pref' button is highlighted with a red rectangle. The dialog box contains the following sections:

- Include:** M1 <Master file>
- Create LOAD_PATH (model 1)**
- Label:** 1
- Title:** <No Load Path name given>
- Buttons:** Return, Help, Save to oa_pref
- 1. Structure selection & PSID definition :**
 - Select:** Select, Select All, Select Visible (4669 elements selected)
 - Elements to exclude from selection:** solids, beams, shells, thick shells
 - Sketch:** Sketch, Show only
 - Xsec PSID:** Auto-create part set, Manually select or create part set
 - PSID:** 21003
- 2. Pitch, position and dimension of XSECs :**
 - Orientation:** Normal to path
 - Pitch:** Pitch, Number of XSECs, Snap to grid
 - Number of XSEC:** 5
 - Start offset:** 0.0, Auto (Offset by half of the pitch)
 - Auto size:** Auto size, Fixed size
 - % increase:** 10.0, Only visible
 - Max size:** 0.0
- 3. Path construction :**
 - Pick nodes:** Pick nodes, Undo last, Reset path
 - Modify path:** Modify path, Sketch path
 - XSEC start label:** 1, Automatically add locations to titles
 - Buttons:** Preview XSECs, Create XSECs

Exporting properties to CSV

- The option to export the cut section properties of all ***DATABASE_CROSS_SECTION**s referenced by a load path to a csv file has also been added.



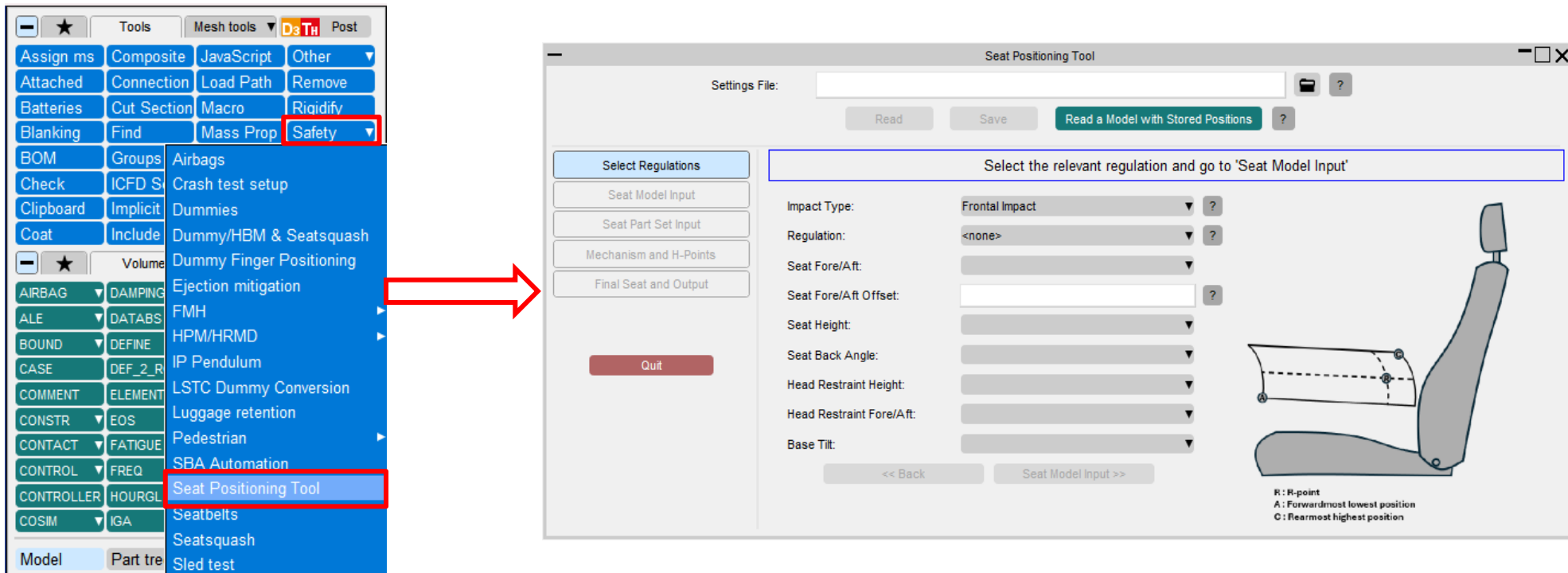
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Cut section properties for load path 1 in model 1																		
2	Cross secti	title	psid	xct	yct	zct	xch	ych	zch	xhev	yhev	zhev	lenl	lenm	Area	Xc	Yc	Xc_g	Yc_g
3	1	X=3162	1001434	3.16E+03	7.01E+02	9.32E+02	3.09E+03	6.78E+02	9.95E+02	3.16E+03	7.01E+02	2.93E+03	8.29E+01	4.75E+01	8.39E+01	3.94E+01	2.44E+01	3.18E+03	7.32E+02
4	2	X=2997	1001434	3.00E+03	6.62E+02	1.06E+03	2.92E+03	6.39E+02	1.13E+03	3.00E+03	6.62E+02	3.06E+03	7.92E+01	4.85E+01	8.25E+01	3.98E+01	2.44E+01	3.01E+03	6.92E+02
5	3	X=2832	1001434	2.83E+03	6.15E+02	1.18E+03	2.75E+03	5.85E+02	1.23E+03	2.83E+03	6.15E+02	3.18E+03	7.73E+01	4.94E+01	8.19E+01	4.00E+01	2.53E+01	2.84E+03	6.46E+02
6	4	X=2659	1001434	2.66E+03	5.51E+02	1.27E+03	2.56E+03	5.43E+02	1.30E+03	2.66E+03	5.51E+02	3.27E+03	7.73E+01	6.77E+01	9.95E+01	4.39E+01	4.04E+01	2.67E+03	5.92E+02
7	5	X=2466	1001434	2.47E+03	4.87E+02	1.33E+03	2.37E+03	4.76E+02	1.35E+03	2.47E+03	4.87E+02	3.33E+03	7.66E+01	9.87E+01	1.31E+02	4.91E+01	5.74E+01	2.47E+03	5.45E+02

Human-Safe Design

Loadcases

Seat Positioning Tool

- This tool enables you to quickly create seat mechanisms and position the seat at various predefined points along the seat track, in accordance with different testing protocols. Specify part sets, node sets, and connection nodes, which are used to build mechanisms such as seat slider, height adjustment, base tilt, and headrest movement.
- The seating positions are determined based on track curve points provided via file input (.iges or text file) or model selection. Once configured, you can easily visualise and position the seat according to different regulatory or design requirements.
- A tutorial is available via Help → Tutorials.



Seat Positioning Tool

- The following testing protocols are supported for Frontal and Side Impact:

Frontal Impact	Side Impact
ASEAN NCAP	ASEAN NCAP
C-IASI	C-IASI
C-NCAP Full Width Rigid Barrier (2024-Hybrid III 50M)	C-NCAP (2024-WorldSID 50M)
C-NCAP 50% Overlapping MPDB (2024-THOR 50M)	EuroNCAP MDB (2023-WorldSID 50M)
EuroNCAP Full Width (2021)	EuroNCAP POLE (2023-WorldSID 50M)
EuroNCAP MPDB (2024)	ISO (WorldSID 50M)
EuroNCAP ODB (2018)	JNCAP (WorldSID 50M)
JNCAP (2023)	KNCAP (WorldSID 50M)
KNCAP Full (2022-Female dummy III)	UN R95 (2014-50M ES-2re Dummy)
KNCAP Offset (2022-Hybrid III 50M)	UN R135 (2016-WorldSID 50M)
US NCAP FMVSS 208 (50th Percentile Male Dummy)	US NCAP FMVSS 214 (50M ES-2re Dummy)
US NCAP FMVSS 208 (5th Percentile Female Dummy)	US NCAP FMVSS 214 (50M SID Dummy)
UN R94 (2022-Hybrid III 50M)	

Seat Positioning Tool

- In the “Seat Model Input” panel, you will need to select a seat model. You will also need to specify "Seat Type," "SGRP-Point (R-point)," and the default seating positions.
- The tool assumes that the seat will be positioned at the default SGRP-point when it is read.
- Select the manufacturer's design position for the various assemblies required by the regulation.

The screenshot displays the 'Seat Positioning Tool' window. On the left is a vertical sidebar with buttons: 'Select Regulations', 'Seat Model Input' (highlighted in blue), 'Seat Part Set Input', 'Mechanism and H-Points', 'Final Seat and Output', and a red 'Quit' button at the bottom. The main area has a 'Settings File' path at the top with 'Read' and 'Save' buttons. Below this is a blue instruction box: 'Select \'Seat Part Set Input >>\' to configure the part set inputs for the mechanism definitions.' The central panel lists various input fields for seat configuration, each with a dropdown menu and a help icon (?). At the bottom of the main panel are two buttons: '<< Select Regulations' and 'Seat Part Set Input >>'. The configuration fields are as follows:

Parameter	Value	Help
Seat Model Input:	G:\OCC_POSN_SCRIPT\OCC_POSN_SCRIPT\demo_seat_model2.ke	?
Seat Type:	FRONT_RIGHT	?
Vehicle Direction:	+X	?
Height Adjustable	YES	?
R-Point:	-373.12079, 510.49701	?
Manufacturer's Seat Fore/Aft:	Full Forward	?
Manufacturer's Seat Fore/Aft Offset:	0	?
Manufacturer's Seat Height:	Mid Point	?
Manufacturer's Seat Back Angle:	Default	?
Manufacturer's Head Restraint Height:	Mid Point	?
Manufacturer's Head Restraint Fore/Aft:	Default	?
Manufacturer's Base Tilt:	Default	?
Default Seat Back Angle:	23	?
Default Seat Base Tilt Angle:	0	?
Default Head Restraint Angle:	0	?
Default Head Restraint Height:	0	?

Seat Positioning Tool

- You will need to select part sets (and node sets if any) to specify different assemblies as shown in the images.
- Click the "?" help button to learn more about the inputs that need to be selected. Specify all the inputs and press "Create Mechanism" to define the mechanisms in the seat.

Seat Positioning Tool

Settings File: documents\SEAT_POSITIONING\OCC_POSN_SCRIPT\OCC_POSN_SCRIPT\seat_pos_inp1.stg

Read Save

Select Regulations
Seat Model Input
Seat Part Set Input
Mechanism and H-Points
Final Seat and Output

Quit

Select 'Create Mechanism' after specifying the relevant seat part set ID(s) for creating mechanisms that allows for seat and headrest adjustment.

Seat Slide & Height Seat Base Tilt Head Restraint Height & Tilt

Seat Back & Bottom

Seat Back Part Set:	12005	Select	C	Visualise	?	Seat Back Node Set:		Select	C	Sketch	?
Seat Cushion Part Set:	12004	Select	C	Visualise	?	Seat Cushion Part Set:		Select	C	Sketch	?
Hinge Conn Node N1:	1244819	Select		Sketch	?	Hinge Conn Node N2:	1252065	Select		Sketch	?

Seat Mount & Slider

Lower Fixed Rails Part Set:	12000	Select	C	Visualise	?	Lower Fixed Rails Node Set:		Select	C	Sketch	?
Upper Moveable Rails Part Set:	12001	Select	C	Visualise	?	Upper Moveable Rails Node Set:		Select	C	Sketch	?
Line Conn Node N1:	1254649	Select		Sketch	?	Line Conn Node N2:	1254508	Select		Sketch	?

Seat Height Adjustment

Front Bar Linkages Part Set:	12002	Select	C	Visualise	?	Front Bar Linkages Node Set:		Select	C	Sketch	?
Rear Bar Linkages Part Set:	12003	Select	C	Visualise	?	Rear Bar Linkages Node Set:		Select	C	Sketch	?
Upper Linkages Cen Node Set:	1200020	Select	C	Sketch	?	Lower Linkages Cen Node Set:	1200021	Select	C	Sketch	?

<< Seat Model Input Create Mechanism Mechanism and H-Points >>

Upper Movable Rail

Lower Fixed Rail

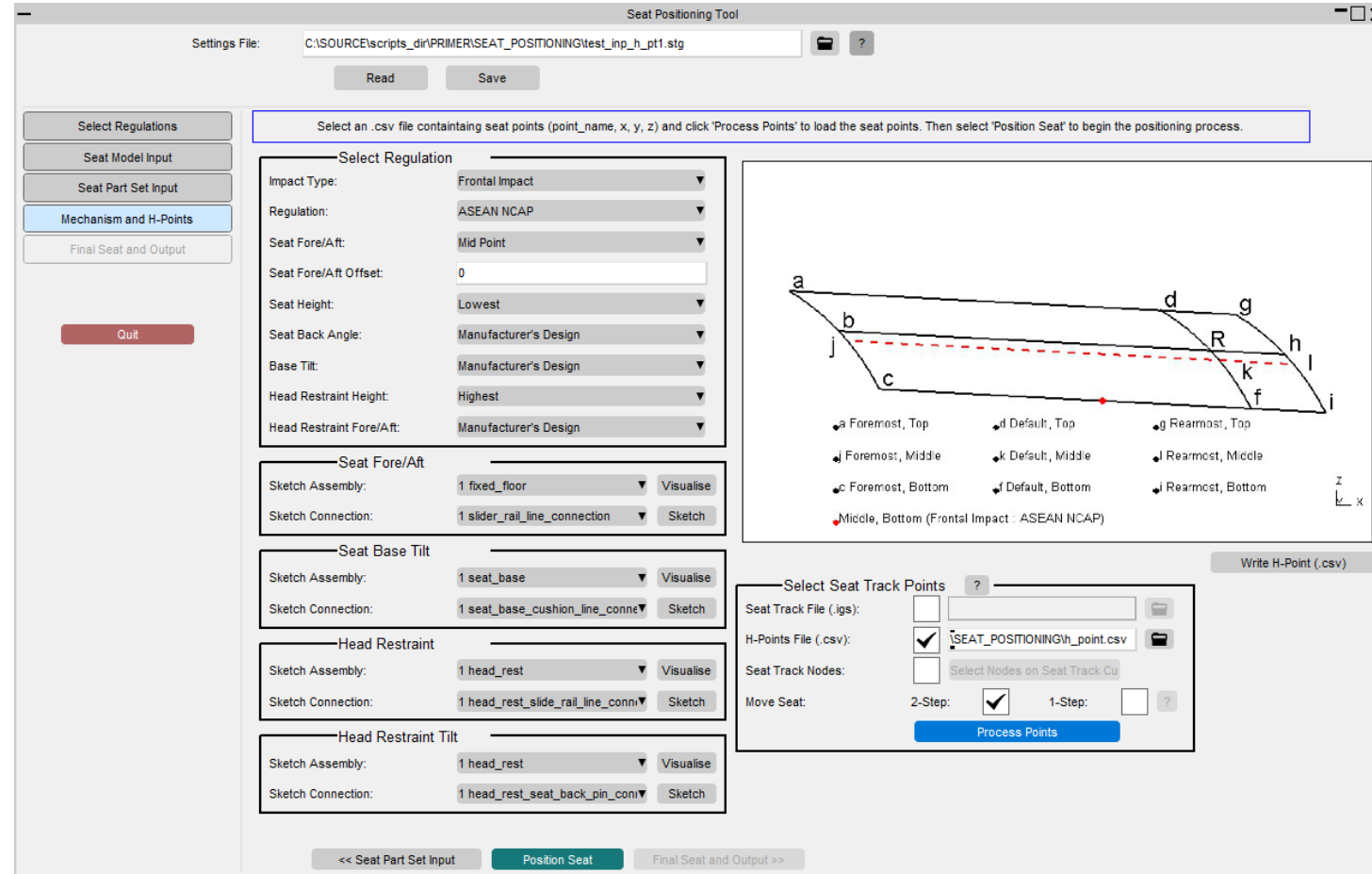
Seat Back

Seat Cushion

Linkage Parts

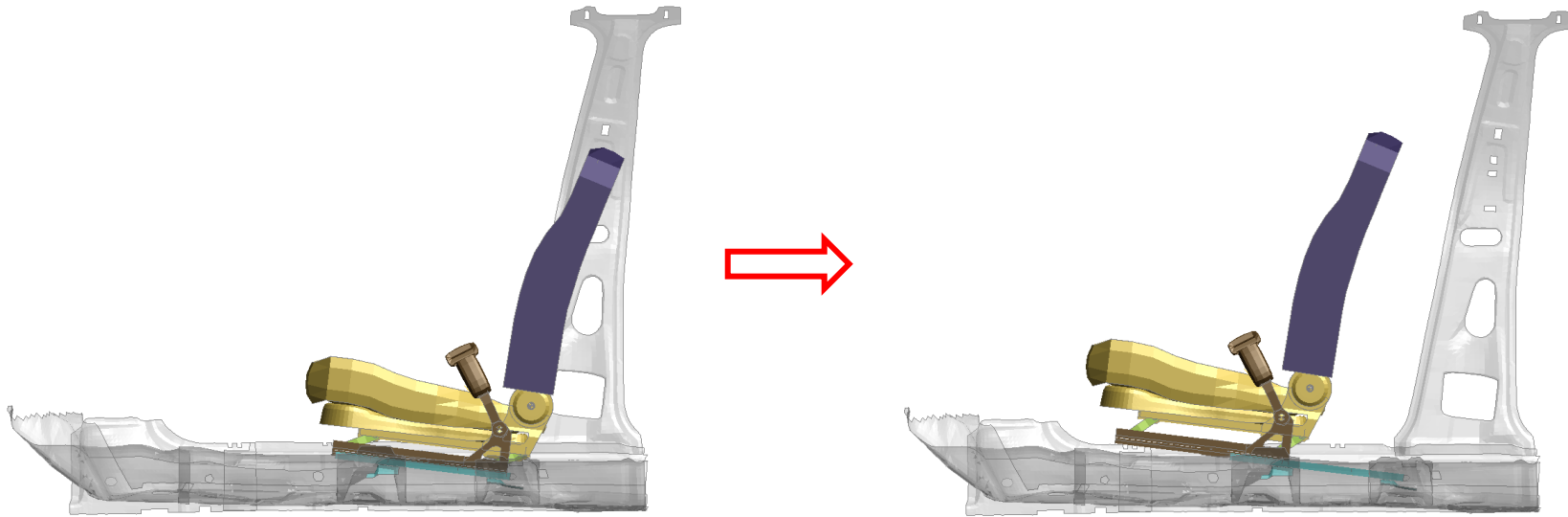
Seat Positioning Tool

- In the Mechanism and H-Points panel, you can visualise assemblies and sketch connections. Select the relevant assemblies/connections from the drop-down to Sketch/Visualise.
- Select Seat Track Points: You can define the seat track curve points using an .iges file, a CSV file (name, x, y, z), or by selecting nodes directly in the model. After selecting the points, click "Process Points" to extract the seating positions—this will activate the "Position Seat" button.
- You can also select a different regulation to position the seat at multiple locations.



Seat Positioning Tool

- After running the tool, you should be able to move the seat from the “Default Position” to a user defined position (e.g., Foremost, Top).



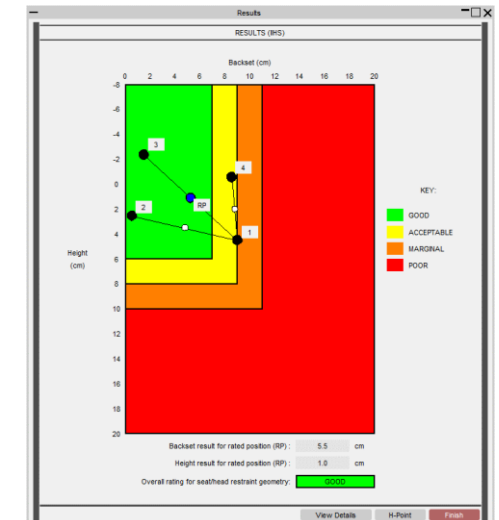
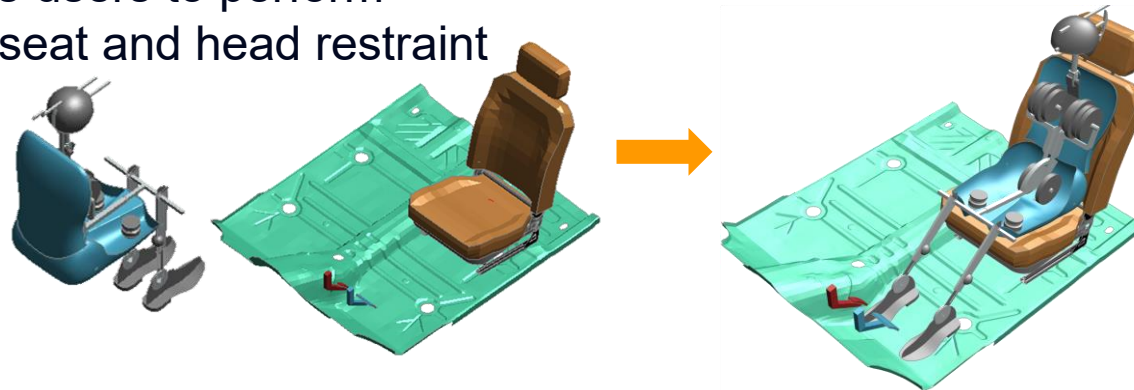
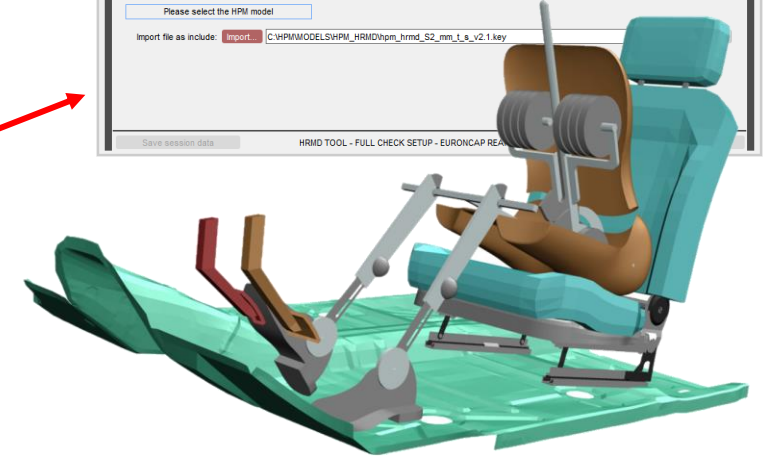
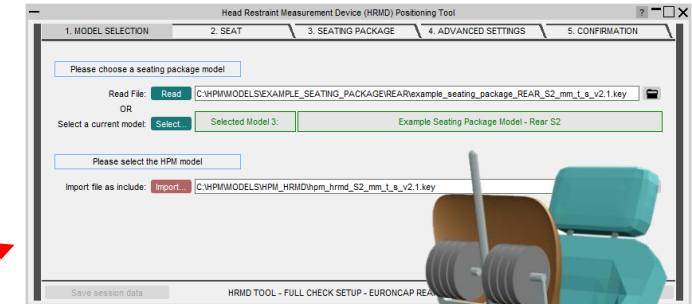
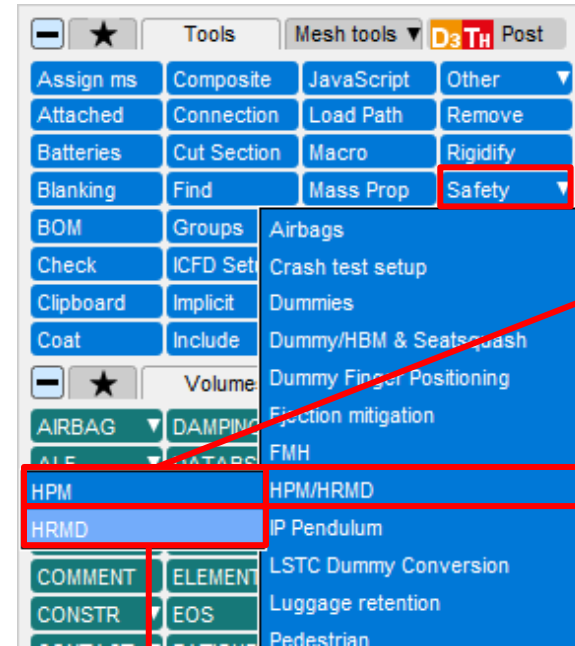
Default Position (R-point)

Foremost, Top

- Model Write Out: There are two methods available for saving the seat model:
 - **Method 1:** Store all seat positions within a single model. To visualize these positions later, use the "**Read a Model with Stored Positions**" option on the main input panel.
 - **Method 2:** Save separate models for each individual seat position.

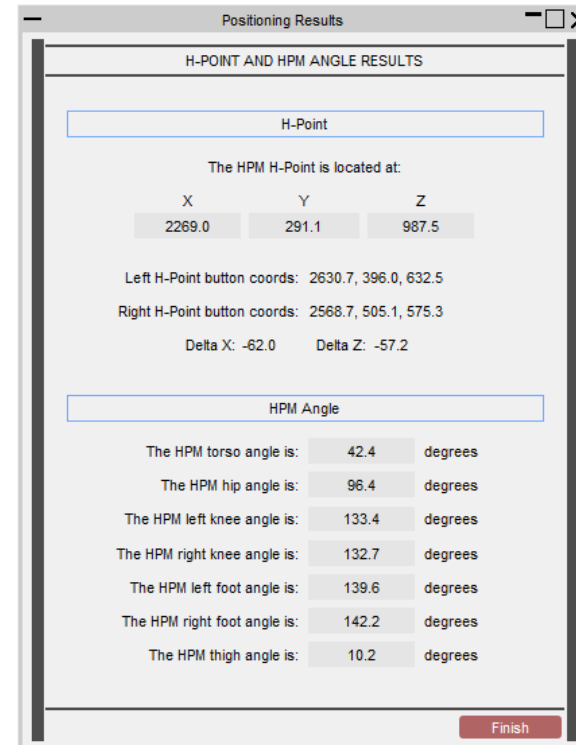
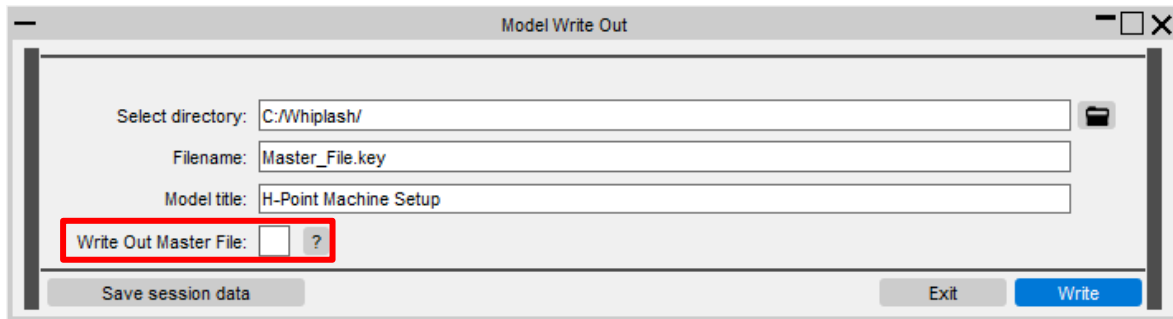
HPM/HRMD Tools

- The H-Point Machine (HPM) and Head Restraint Measurement Device (HRMD) Tools are now available in the Tools menu.
- A separate licence is needed to run the tool in PRIMER and gain access to the required HPM/HRMD models (no extra licence is necessary to then run in Ansys LS-DYNA).
- The HPM tool enables users to quickly and easily set-up an analysis to find the H-point of your particular seat/seating package model within the Ansys LS-DYNA suite.
- The HRMD tool allows users to perform assessments of your seat and head restraint geometries.



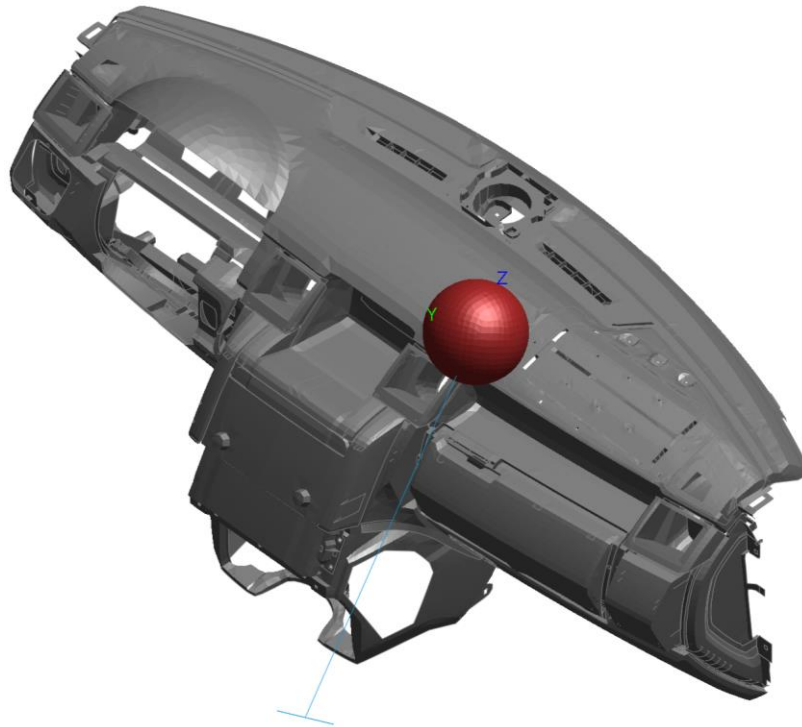
HPM/HRMD Tools

- Euro NCAP protocols have been updated to the latest regulations:
 - Whiplash Test Protocol 4.2 (2023);
 - Rear Whiplash Test Protocol 1.1 (2018);
 - Euro NCAP Assessment Protocol 9.3 (2023).
- Improved occupant and seat positioning angle feedback.
- Master file can now be written out to retain original input model as an include file.



IP Pendulum – Enhancements

- The IP Pendulum tool is used to set up multiple Instrument Panel Pendulum impact models.
- In PRIMER 22.0 the default ECE R21 option automatically applies ***DEFINE_TRANSFORMATION** to rotate the line of flight onto the trim normal if the impact angle is more than 5 degrees.
The ECE R21 (Deprecated) option does not apply any rotation.



IP PENDULUM IMPACT

Model 1 :: IPP 1 selected

Title: IPP impactor

Contact: 1 Create

velocity: 6694.444 Settings

H-point: 1395.0 420.0 525.0

Target name: n/a

Target coord: n/a Sketch

Impact coord: n/a Sketch

Angle to IP normal: n/a

Theta: n/a

Beta: n/a

Alpha: n/a

Line of flight: n/a

Velocity(at centre): n/a

IPP targetting panel

☐ FMVSS201

☒ ECE R21

☐ ECE R21 (Deprecated)

☐ Converge aim point to target point

☐ Converge contact point to target point

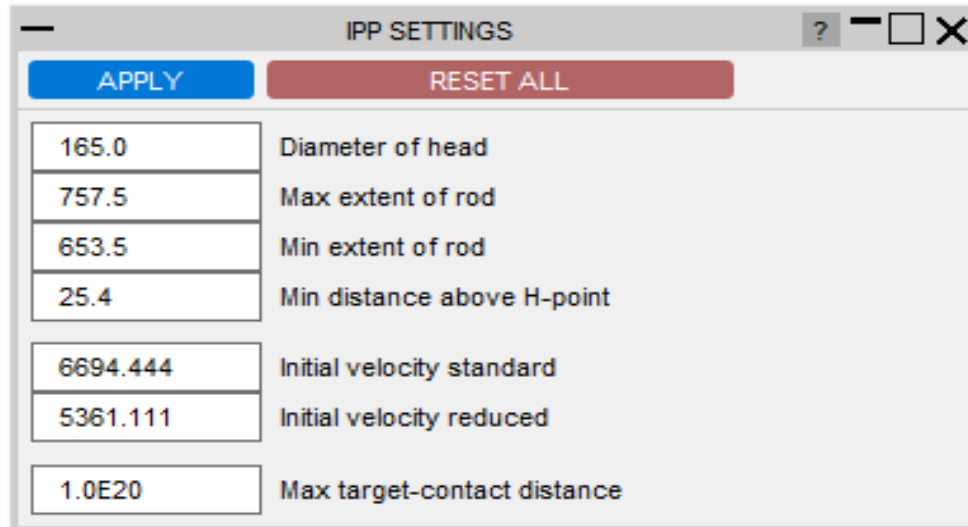
☒ Combined solution

☒ No redraw

☐ Redraw

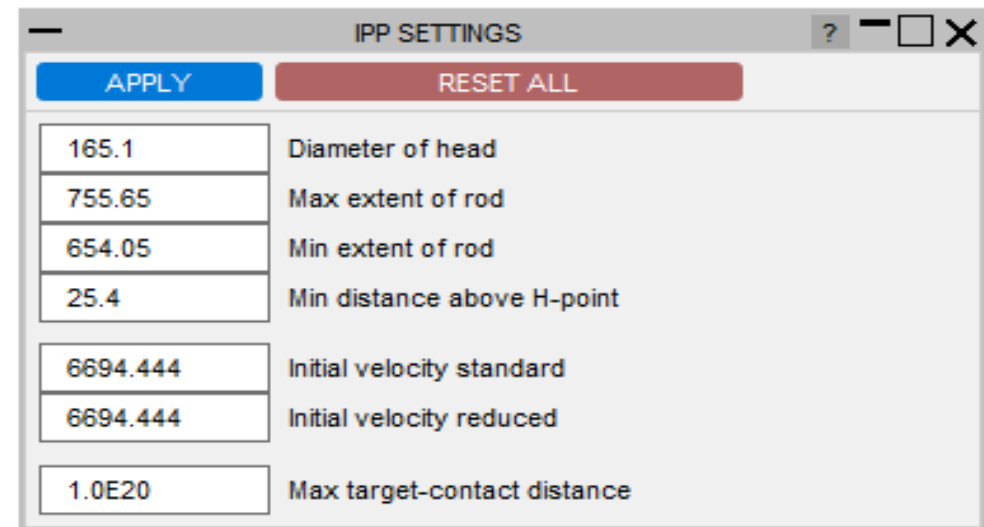
IP Pendulum – Enhancements

- Default settings for FMVSS201 have been added.
- When the regulation is switched between FMVSS201 and ECER21 you are now asked to confirm whether the settings should be updated to the new regulation. Any settings can be further modified if required.
- A default pendulum can be found in \$OA_INSTALL/primer_library/Arup_Pendulum. However, you can also use your own pendulum model.



Value	Parameter
165.0	Diameter of head
757.5	Max extent of rod
653.5	Min extent of rod
25.4	Min distance above H-point
6694.444	Initial velocity standard
5361.111	Initial velocity reduced
1.0E20	Max target-contact distance

Default settings for ECE R21

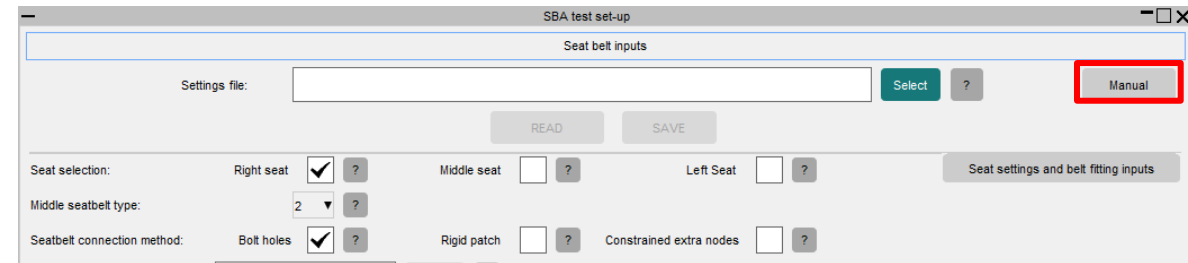
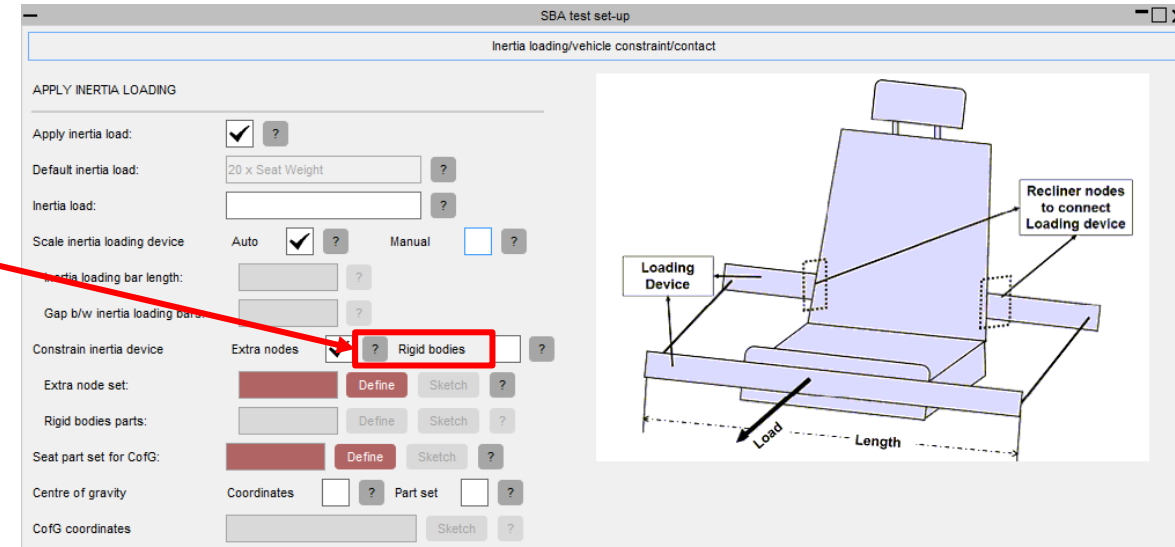


Value	Parameter
165.1	Diameter of head
755.65	Max extent of rod
654.05	Min extent of rod
25.4	Min distance above H-point
6694.444	Initial velocity standard
6694.444	Initial velocity reduced
1.0E20	Max target-contact distance

Default settings for FMVSS201

Other Safety Tool Updates

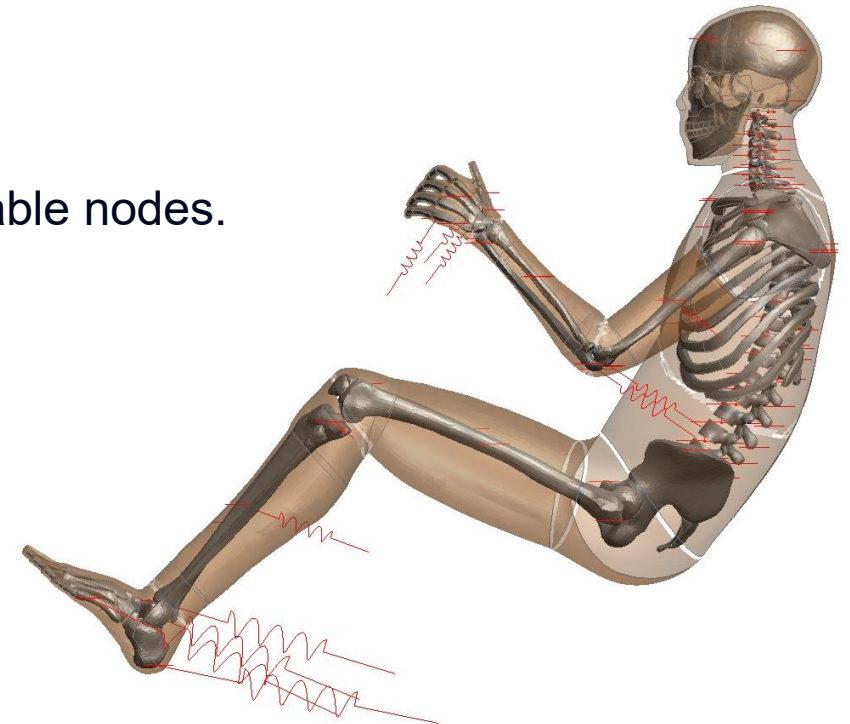
- In the Seat Belt Anchorage tool:
 - There is an additional option available to constrain the inertia loading device using rigid bodies.
- In the Luggage Retention tool:
 - The sliding planes have been constrained to the bottom rigid plate so that they will move together.
- In both Seat Belt Anchorage and Luggage Retention tools:
 - A check has now been added for constrained extra nodes. The tool will issue a warning if any node in the set belongs to an NRB, a rigid body, or references a rigid part.
- The help manual can be accessed directly from the input panels of the Seat Belt Anchorage, Luggage Retention, and Sled Test tools.



HBM Tools

Positioning cable elements for HBMs

- Simulation-based positioning of Dummies/HBMs uses cables (shown in **RED** in the image) to pull assemblies into the desired position using an Ansys LS-DYNA simulation.
- There are two types of cable available: force-based and displacement-based.
- Displacement-based cables are highly recommended because they ensure the target is reached by the end of the analysis. However, with just three per assembly, it was reported that sometimes high cable loads caused excessive deformation and oscillations in HBMs.
- To improve this, from PRIMER 22.0 onwards:
 - ***ASSEMBLY** definitions for HBMs can now have more than three cable nodes.
 - Cable attachment locations can be selected by the user.
 - Load curves controlling the cable length reduction (“displacement”) have been improved to reduce peak load and oscillations.



Updates to *ASSEMBLY keyword for Dummies/HBMs

- From PRIMER 22.0 onwards, users can select more than three positioning cable nodes on a HBM assembly.
- The ***ASSEMBLY** definition for HBMs has been updated in the following ways:
 1. The bitwise encoded **dyna_pos** field gives the details of the positioning cable nodes for the assembly;
 2. The nodes selected for each HBM assembly are now added into a ***SET_NODE** and the reference for this set is mentioned in the ***ASSEMBLY** card.

***ASSEMBLY**

<label>	<Title>
---------	---------

```
<#SET_PARTs> <#PARTs> <#children> <#SET_NODES> <locked> (<csys>) <#contacts> <dyna_pos>
```

<#List of SET_PARTs>

<#List of PARTs>

<#List of SET NODEs>

<#List of CONTACTs>

<#List of CHILD ASSEMBLIESs>

```
<#List of positioning cable nodes> (Dummies/ATDs/HBMs)
```

<SET_NODE label for positioning cables nodes > (Only HBMs)

1

<dyna pos>

I10

Dyna position data flag (bitwise)

```
|1: data to be read;
```

|2: assembly flagged to be rigidified; (so value of 3 means 1 and 2 apply);

|4: no cables created for assembly;

|8: cable attachment nodes are kept in a SET NODE;

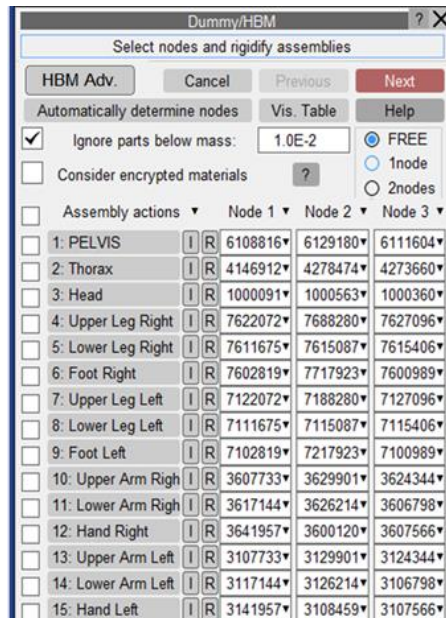
16: more than three cable attachment nodes in the assembly;

`|(dyna_pos & 31) >> 5`: gives the number of nodes

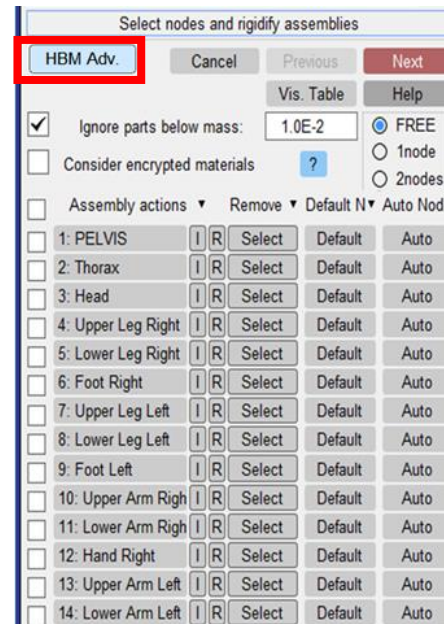
2

Select positioning cable nodes for HBM assemblies

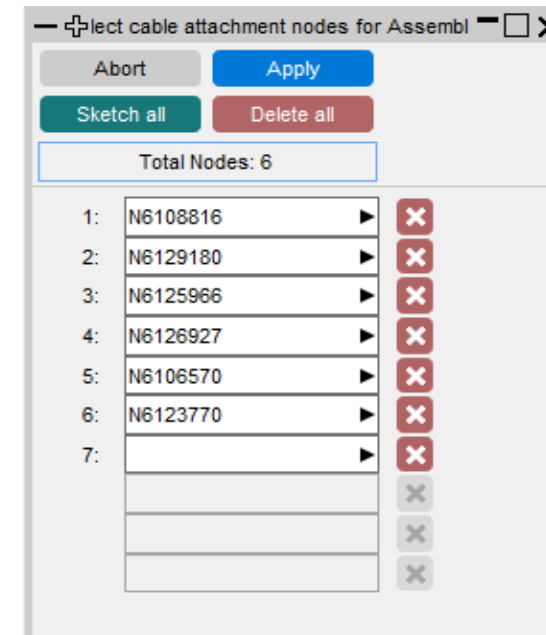
- **For Dummies:** You can select up to three positioning cable nodes for an assembly, as before.
- **For HBMs:** Pressing the “**HBM Adv.**” toggle button maps a new “advanced” panel for updating the positioning cable nodes.
- The positioning cable nodes for each assembly can be defined via a new selection panel. This new selection panel shows only the “rigid” entities in the graphics window to allow easy picking of the positioning cable nodes.
- You can select any number of nodes on a HBM assembly, and all these nodes get added in to a ***SET_NODE** entity.



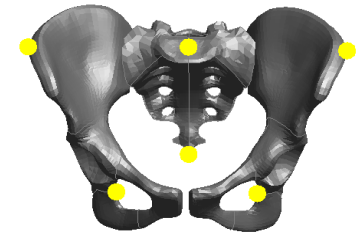
For Dummies/ATDs/HBMs



Only for HBMs

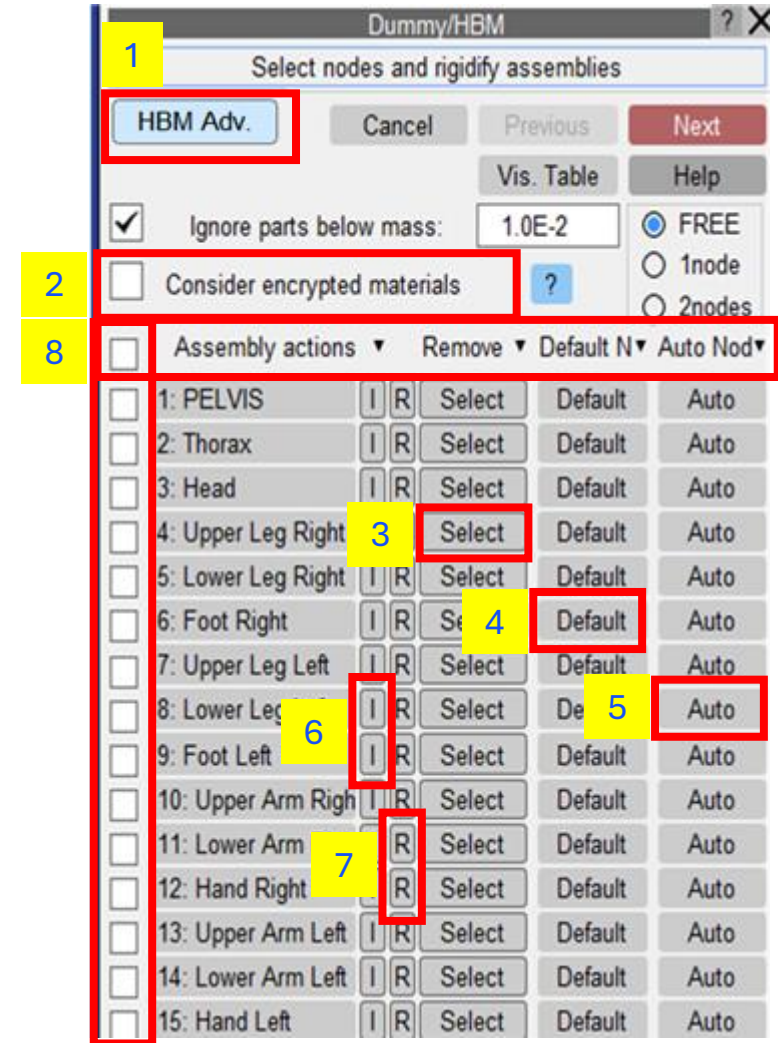


Selection panel and graphics view in PRIMER



New panel to process positioning cable nodes

1. The **HBM Adv.** button maps the new “advanced panel” for updating positioning cable nodes.
 - A new preference controls whether the updated HBM panel is mapped by default:
`primer*hbm_use_new_cable_node_panel`
2. Even though some HBMs come with “encrypted” materials, PRIMER can still identify the “rigid” entities for the HBM by ticking this checkbox as ON.
 - A new preference controls the value of this button by default:
`primer*hbm_use_encrypted_mats_for_cables`
3. The **Select** button launches a new panel to select the positioning cable nodes for that assembly.
4. The **Default** button reverts the positioning cable nodes to the defaults defined in the original positioning tree.
5. The **Auto** button automatically re-calculates up to three positioning cable nodes to attach cables on that assembly.
6. Pressing the “**I**” button ignores that assembly for positioning cable nodes.
7. Pressing the “**R**” button rigidifies that whole assembly.
8. Using the check buttons on the left and the menus on the top of the assembly list, you can process positioning cable nodes on multiple assemblies simultaneously.

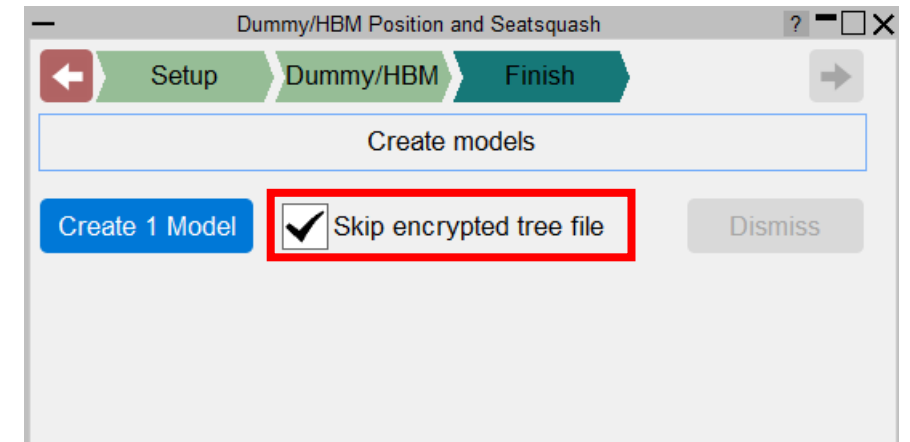


Updates to load curves for Dummy/HBM positioning

- PRIMER creates new keywords for each of the cable elements during the positioning simulation.
- The displacement of the cable elements uses the load curves included in these new keyword definitions.
- From PRIMER 22.0 the load curve definitions have been refined to make the displacements smoother.
- You can choose to use:
 - The new definition of the load curve (default). This is specific to each of the positioning cables created for each assembly and aims to reduce peak load and oscillations.
 - A load curve definition equivalent to the previous load curve method.
 - A new preference controls this behaviour: `primer*dummy_hbm_use_new_cable_equation`

Writing positioned HBM without the encrypted HBM tree file

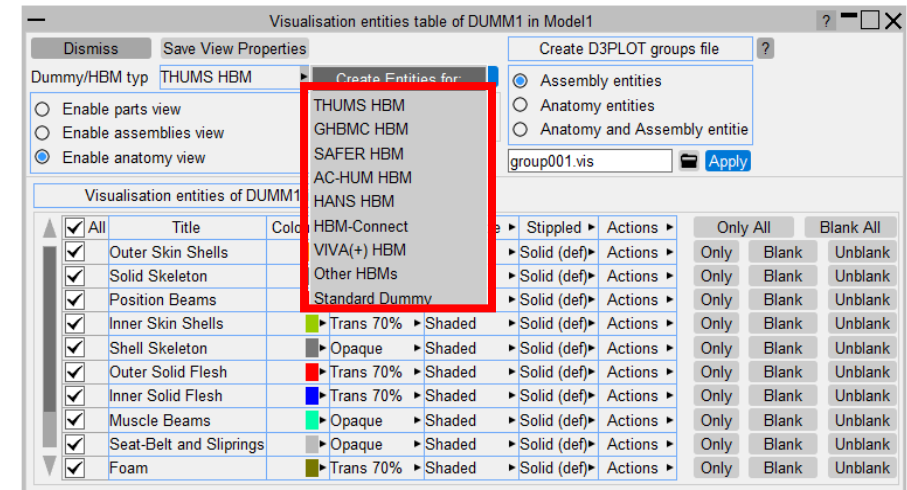
- The PRIMER positioning tools for HBMs always need to load the PRIMER positioning tree files. These positioning tree files are unique for a HBM type.
- Since these positioning tree files are “encrypted”, these files cannot be read outside PRIMER.
- Therefore, the reference to this file must be removed from the master model deck before submitting the positioned model files for Ansys LS-DYNA positioning simulations.
- From PRIMER 22.0 onwards, a new check button is added to the “Create Model” panel of the “Combined Dummy and Seatsquash” tool.
- By enabling this check button, you can create a model ready for a positioning analysis “without” the encrypted HBM tree include.



HBM Trees

Positioning trees for HBMs

- PRIMER positioning tree files help position and prepare HBMs for Ansys LS-DYNA analysis.
- Tree files are free to PRIMER users and available from your local distributor.
- Positioning tree files are available for the following HBMs:
 - **GHBMC** (Elemance)
 - Detailed HBMs – occupant and pedestrian models;
 - Simplified HBMs – occupant and pedestrian models;
 - **THUMS** – occupant, pedestrian and TB-024 models;
 - **SAFER**;
 - **VIVA(+)** – seated and standing;
 - **AC-HUM** (CAERI) – occupant and pedestrian;
 - **HBM-Connect** (Humanetics);
 - **HANS** (Ansys-Dynamore);
- PRIMER also supports visualisation of all the above HBMs via the “**Visualisation Table**” tool.



Supported GHBMC models – detailed

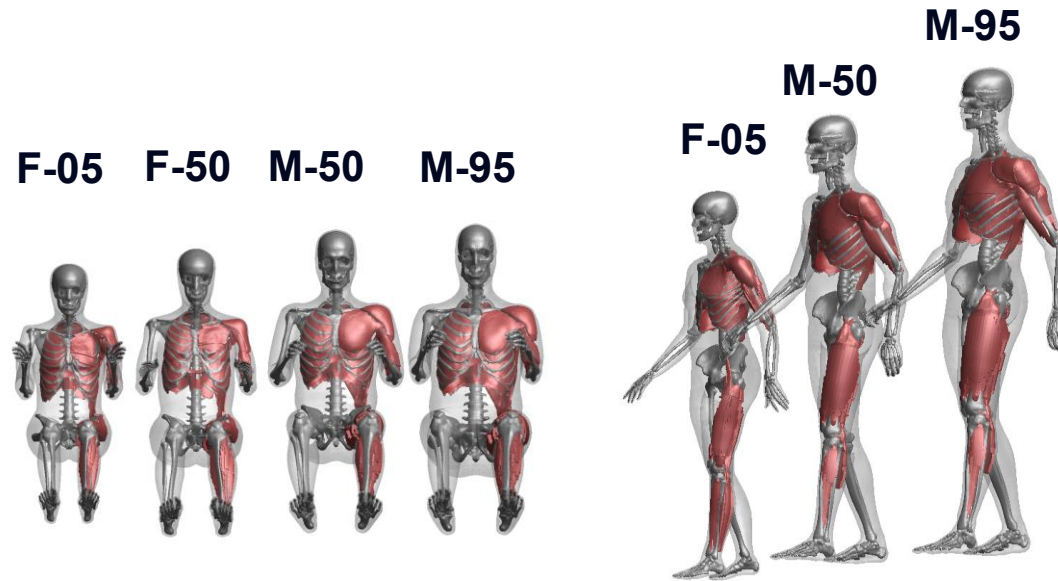
- PRIMER supports the positioning for all the available versions of the GHBMC “Detailed” HBMs.
- PRIMER also supports the positioning for all the previously released versions of these HBMs.
- Tree files are free to PRIMER users and available from your local distributor.

- **Detailed occupants**

- F50-O **v6.03**
- F05-O v6.0
- M50-O **v6.2**
- M95-O v6.0

- **Detailed pedestrians**

- F05-P v1.2/v5.3.4
- M50-P v1.6/v5.3.1/v5.3.4
- M95-P v1.2/v5.3.4



Detailed Occupants

Detailed Pedestrians

Supported GHBMC models – simplified

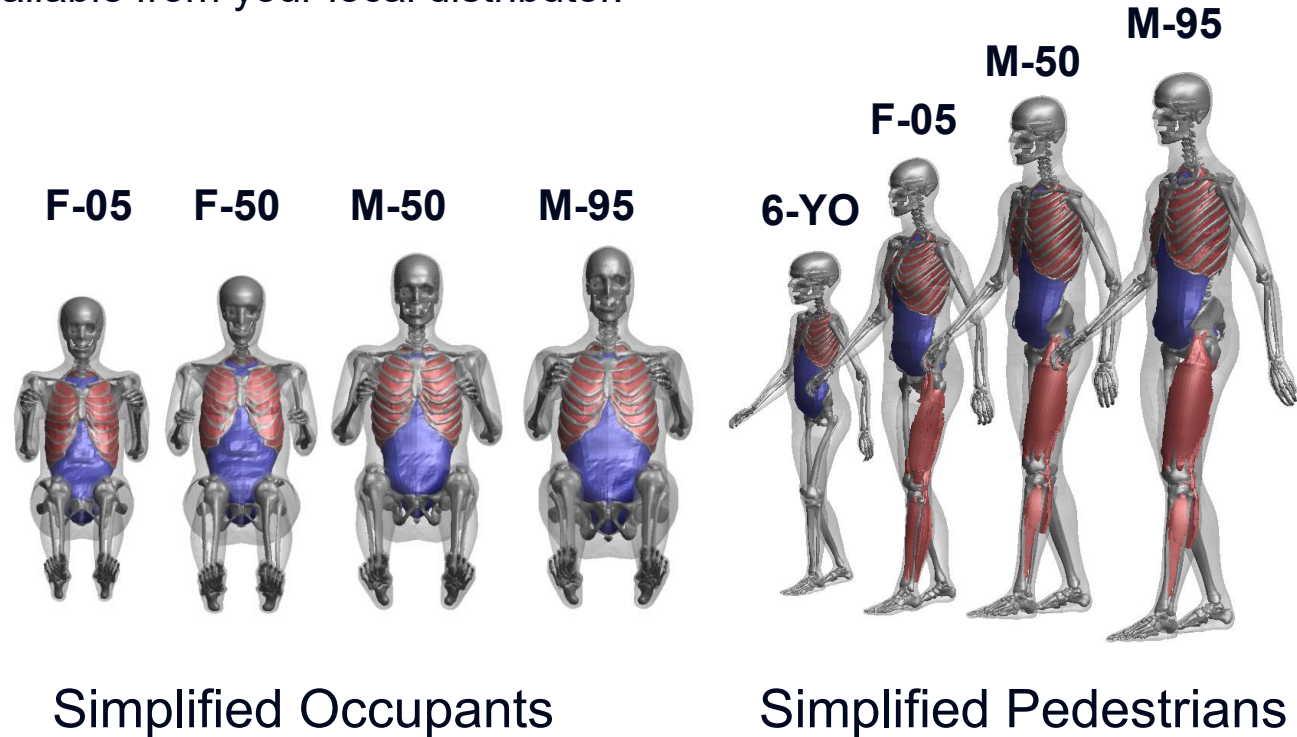
- PRIMER supports the positioning for all the available versions of the GHBMC “Simplified” HBMs.
- PRIMER also supports the positioning for all the previously released versions of these HBMs.
- Tree files are free to PRIMER users and available from your local distributor.

- **Simplified occupants**

- F50-OS **v2.3.2**
- F05-OS v2.3
- M50-OS v2.3
- M95-OS v2.3

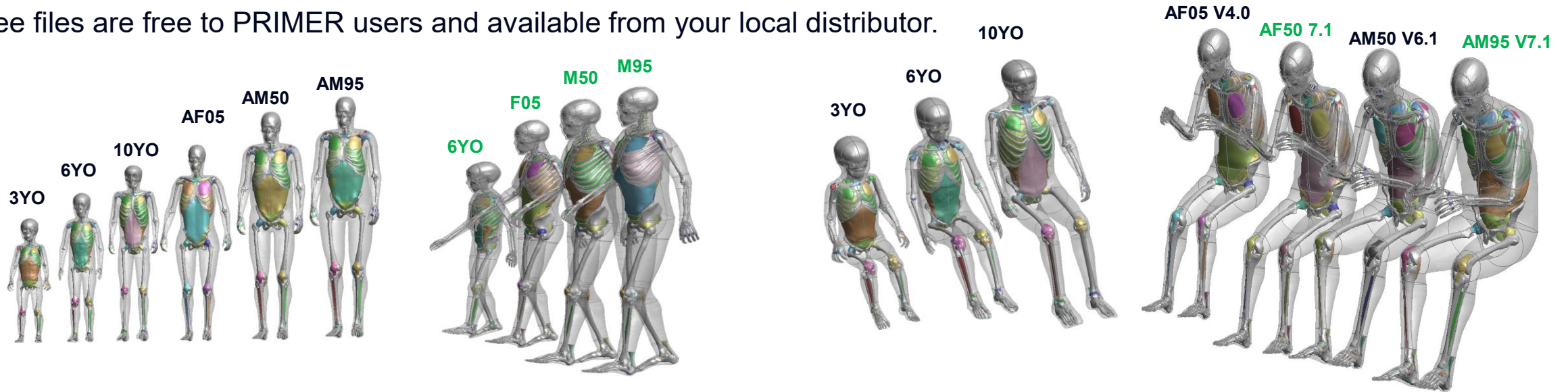
- **Simplified pedestrians**

- F05-PS v1.8/v5.3.5
- M50-PS v1.8/v5.3.5
- M95-PS v1.8/v5.3.5
- 3YO-PS v1.8
- 6YO-PS v1.8/2.8.2
- 10YO-PS v1.8



Supported THUMS models

- PRIMER supports the positioning for all the available versions of the THUMS “Pedestrian” and “Occupant” HBMs.
- PRIMER also supports the positioning for all the **EuroNCAP TB-024** HBMs.
- Tree files are free to PRIMER users and available from your local distributor.



- **Version 4 Pedestrians:**

- AF05-P v4.02
- AM50-P v4.02
- AM95-P v4.02
- 3YO/6YO/10YO v4.0

- **Version 4 TB-024:**

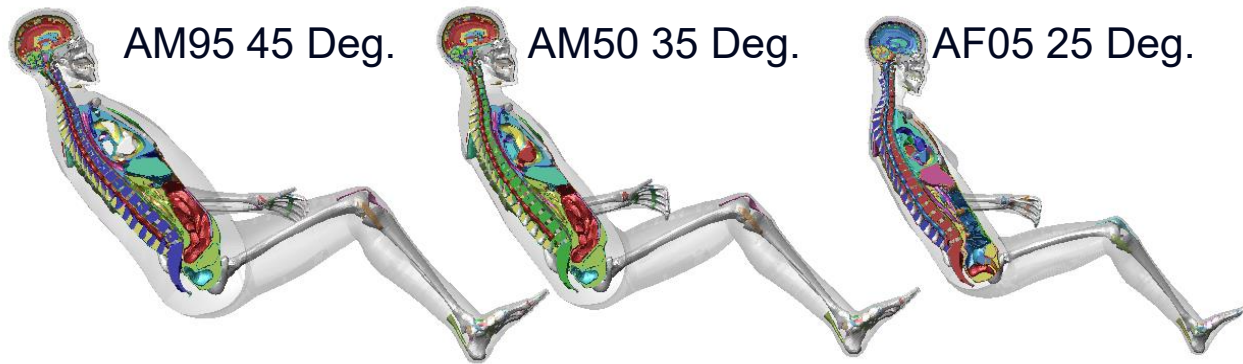
- AF05-P v4.02
- AM50-P v4.02
- AM95-P v4.02
- 6YO v4.0

- **Version 4/5/6/7/7.1 Occupants:**

- AF05-O v4.1/v5.0.3/v6.1/v7/**v7.1**
- AM50-O v4.1/v5.0.3/v6.1/ v7/**v7.1**
- AM95-O v4.1/v5.0.3/v6.1/ v7/**v7.1**
- 3YO/6YO/10YO v4.0

Supported THUMS models – reclined and others

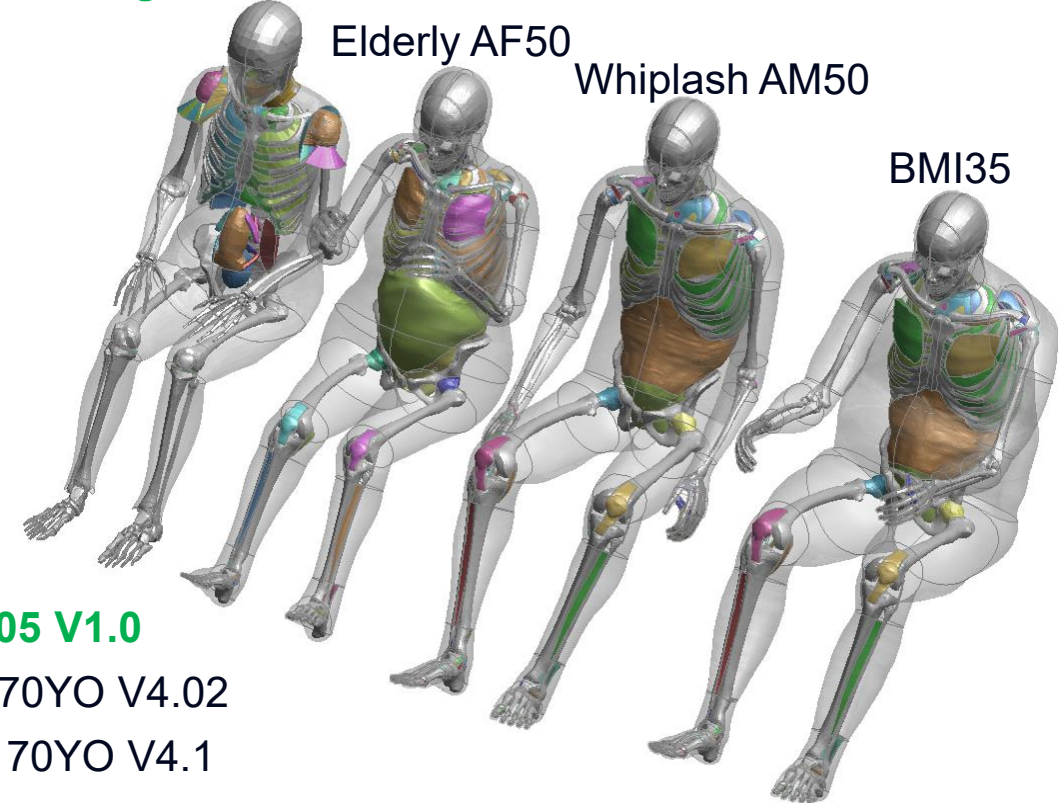
- PRIMER supports the positioning for all the available versions of the THUMS “Reclined” HBMs.
- PRIMER also supports the positioning for all the Other category HBMs, including the **Pregnant** HBM.
- Tree files are free to PRIMER users and available from your local distributor.



- **Seatback Reclined (25/35/45 Deg.):**
 - AF05-O v7
 - AM50-O v7
 - AM95-O v7
- **Others:**

- **Pregnant AF05 V1.0**
- Elderly AF50 70YO V4.02
- Elderly AM50 70YO V4.1
- Whiplash AF50/AM50 V4.0
- Obese BMI35 V4.0

Pregnant AF05

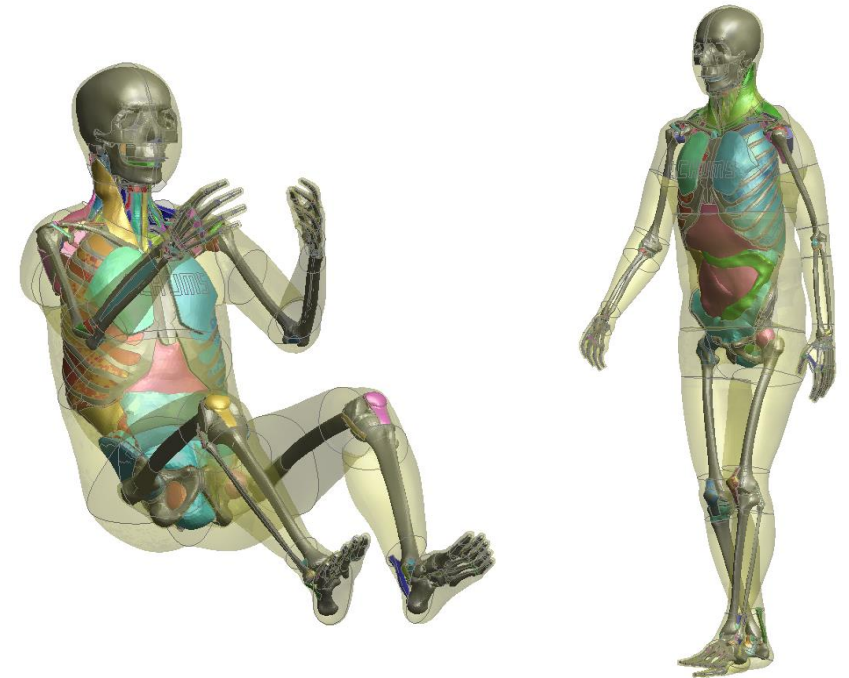


Supported AC-HUM HBMs (CAERI)

- PRIMER supports the positioning for all the available versions of the AC-HUM HBMs from CAERI:
 - **AM50 Occupant V1.3 (S2/S3)**
 - **AM50 Pedestrian V1.3 (S2/S3)**
 - **AM95 Occupant V1.3 (S2/S3)**
 - **AM95 Pedestrian V1.3 (S2/S3)**
- PRIMER also supports the positioning for all the previously released versions of these HBMs.
- Tree files are free to PRIMER users and available from your local distributor.

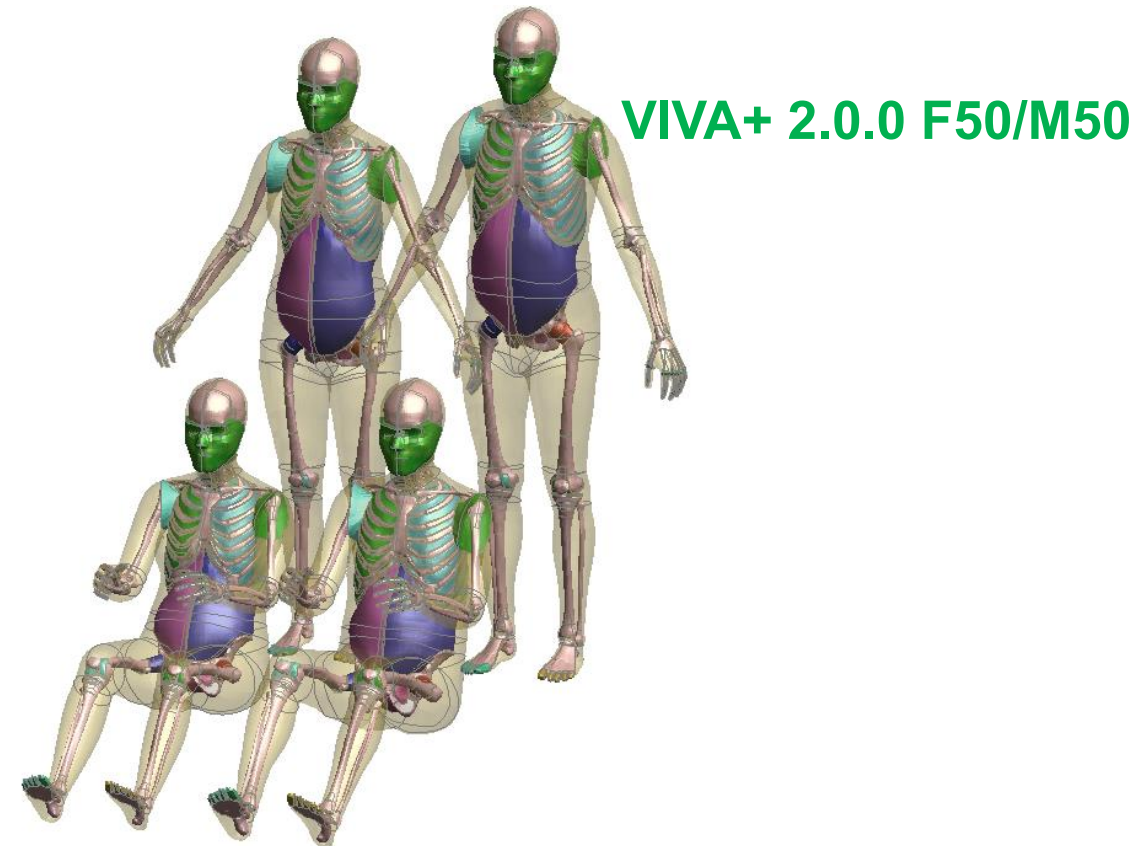


中国汽研
CAERI



Supported SAFER/VIVA+ HBMs

- PRIMER supports the positioning for the **SAFER** Occupant HBM V11.1.0.
- PRIMER also supports positioning for the **VIVA+ 2.x** HBMs – both seated and standing postures.
- Tree files are free to PRIMER users and available from your local distributor.

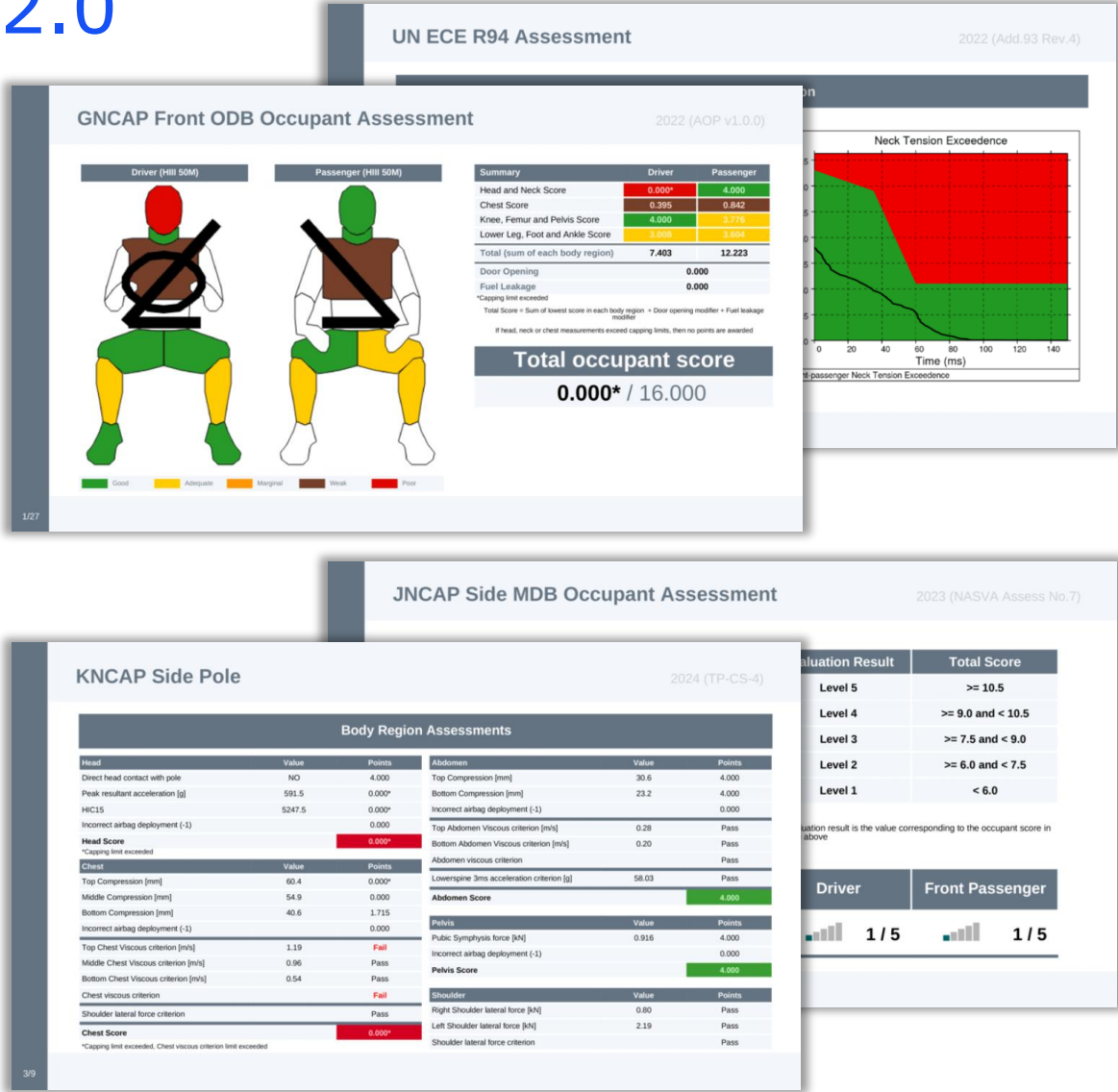


Automotive Protocols

New Protocols and Regulations V22.0

- Automotive Assessments and REPORTER now support the following new protocols and regulations:

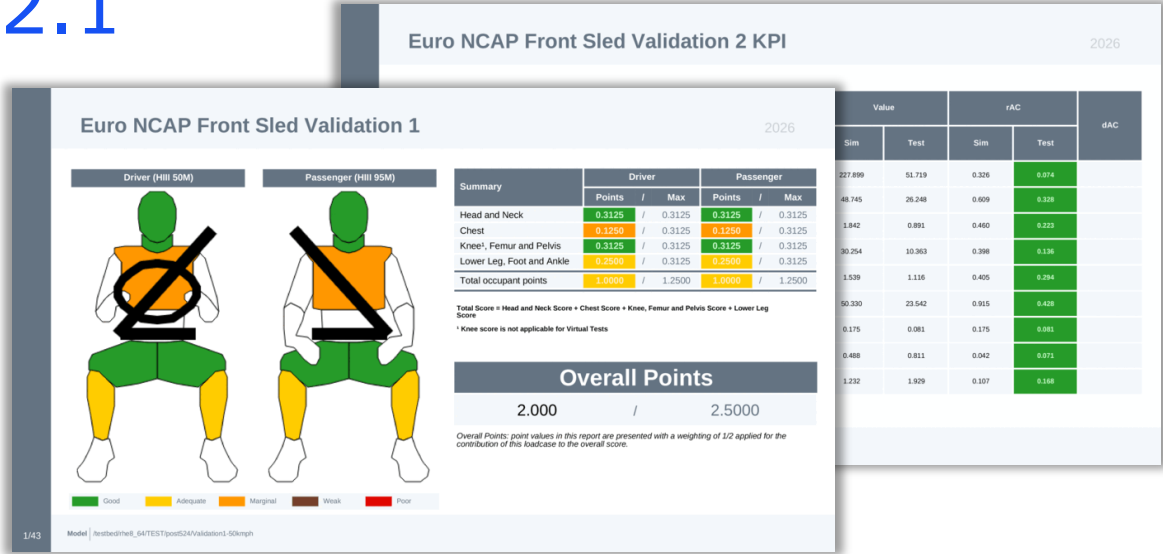
Regulation	Loadcase
Global NCAP	MDB, ODB, Side Pole
JNCAP	FFB, MDB, ODB
KNCAP	FFB, MDB, Side Pole
UN ECE	R94, R95, R135, R137



New Protocols and Regulations V22.1

- Automotive Assessments and REPORTER now support the following new protocols and regulations:

Regulation	Loadcase
C-NCAP	Far Side (inc O2O & Official Format Versions), Front AEB OOP (Official Format), Side MDB, FRB
FMVSS	208 Front FFB
Euro NCAP	FWDB 2026, Front Sled 2026 (Validation 1 + (KPI), Validation 2 + (KPI), Robustness 1, Robustness 2, Robustness 3)



Upgraded Protocols

- The following protocols have been updated:

Regulation	Loadcase	Update
C-NCAP	MPDB Occupant Assessment	<ul style="list-style-type: none">• Rear Occupants Added
Euro NCAP	MPDB Occupant Assessment	<ul style="list-style-type: none">• 2024 (Follows Adult Occupant Protocol v9.3)• Includes DAMAGE assessment
IIHS	Front SOB	<ul style="list-style-type: none">• 2024 (Version VII)• New fuel modifier
IIHS	Side MDB	<ul style="list-style-type: none">• 2024 (Version IV)• New fuel modifier and updated head protection rating system

Latest Protocol Support

Automotive Assessments Workflow

- Available for some time
- New in version 22.1
- New in version 22.0

Regulation	Year	Loadcase/Workflow	PRIMER	T/HIS	D3PLOT	REPORTER (migrated to workflows)	REPORTER (standard template)
C-NCAP	2018	ODB	●	●			●
	2021	Head Impact					●
		Leg Impact					●
	2023	MPDB Compatibility					●
	2024	MPDB Occupant	●	●		●	
		Side Pole	●	●		●	
		Far Side Pole	●	●		●	
		Far Side Sled	●	●		●	
		VTC Quality Criteria	●	●		●	
		VTC Videos	●		●	●	
		LS-DYNA to ISO-MME	●	●		●	
		SimVT		●		●	
		FRB	●	●		●	
		Side MDB	●	●		●	
		Far Side CNCAP Official Format	●	●	●	●	
		O2O CNCAP Official Format	●	●	●	●	
		O2O VTC Quality Criteria	●		●	●	
		O2O VTC Videos	●	●		●	
		Front AEB OOP Official Format	●	●	●	●	
		Front AEB OOP Quality Criteria	●	●		Part of Official Format	
		Front AEB OOP VTC Videos	●		●	Part of Official Format	

Latest Protocol Support

Automotive Assessments Workflow

- Available for some time
- New in version 22.1
- New in version 22.0

Regulation	Year	Loadcase/Workflow	PRIMER	T/HIS	D3PLOT	REPORTER (migrated to workflows)	REPORTER (standard template)
Euro NCAP	2017	FFB	●	●		●	
		ODB	●	●		●	
	2020	MPDB Occupant	●	●		●	
		Side Pole	●	●			
		MDB	●	●	●		
	2022	Far Side	●	●	●		
		MDB	●	●	●	●	
		Side Pole	●	●		●	
	2023	MPDB Compatibility					●
		Head Impact					●
		Leg Impact					●
	Continued...						

Latest Protocol Support

- Available for some time
- New in version 22.1
- New in version 22.0

Automotive Assessments Workflow

Regulation	Year	Loadcase/Workflow	PRIMER	T/HIS	D3PLOT	REPORTER (migrated to workflows)	REPORTER (standard template)
Euro NCAP	2024	Far Side Sled	●	●		●	
		MPDB Occupant	●	●		●	
		VTC Quality Criteria	●	●		●	
		VTC Videos	●		●	●	
		LS-DYNA to ISO-MME	●	●		●	
		SimVT		●		●	
	2026	Front Sled	●	●		●	
		FWDB Full Vehicle	●	●		●	
		VTC Quality Criteria	●	●		●	
		VTC HBM Quality Criteria	●	●		●	
		SimVT		●		●	

Latest Protocol Support

Automotive Assessments Workflow

- Available for some time
- New in version 22.1
- New in version 22.0

Regulation	Year	Loadcase/Workflow	PRIMER	T/HIS	D3PLOT	REPORTER (migrated to workflows)	REPORTER (standard template)
FMVSS	2024	208 Front FFB	●	●		●	
Global NCAP	2022	MDB	●	●		●	
	2023	ODB	●	●		●	
	2024	Side Pole	●	●		●	
GTR	2019	Leg Impact					●
	2020	Head Impact					●
IIHS	2017	MDB	●	●	●		
		ODB	●	●			
		SOB	●	●			
	Continued...						

Latest Protocol Support

Automotive Assessments Workflow

- Available for some time
- New in version 21.1
- New in version 22.0

Regulation	Year	Loadcase/Workflow	PRIMER	T/HIS	D3PLOT	REPORTER (migrated to workflows)	REPORTER (standard template)
IIHS	2021	MDB	●	●	●	●	
		MDB Structure Only				●	
		ODB	●	●		●	
		ODB Structure Only				●	
		SOB	●	●		●	
		SOB Structure Only				●	
	2024	MDB	●	●		●	
		MDB Structure Only				●	
		SOB	●	●		●	
		SOB Structure Only				●	

Latest Protocol Support

Automotive Assessments Workflow

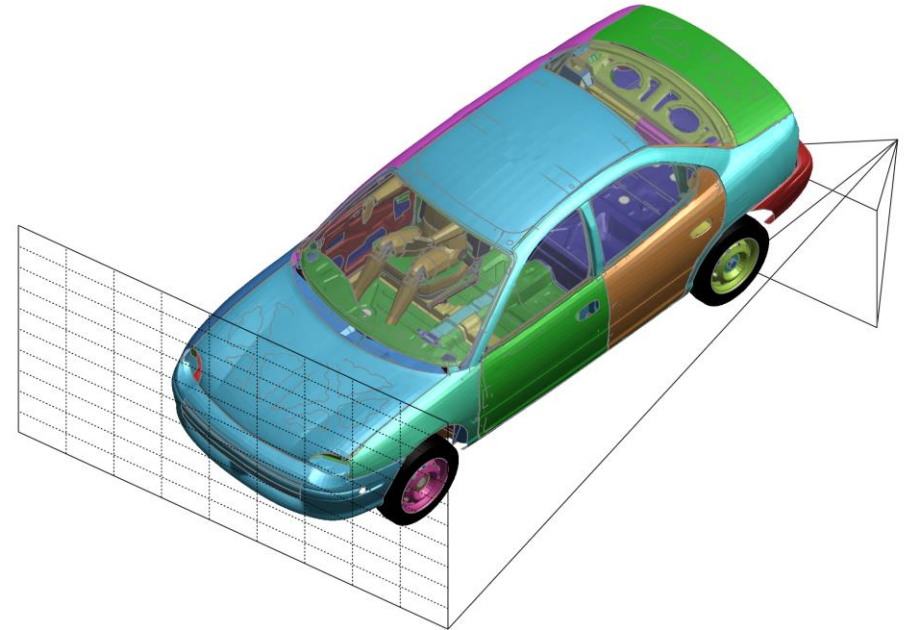
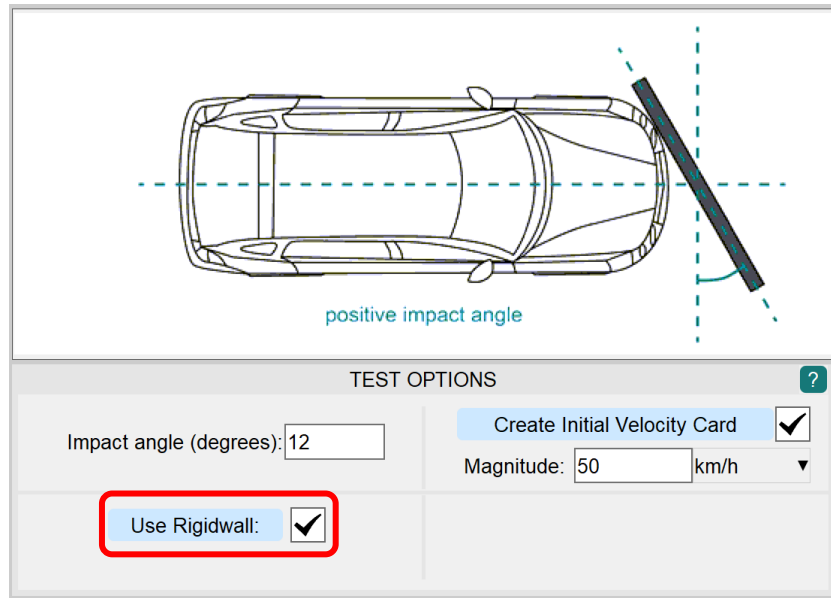
- Available for some time
- New in version 22.1
- New in version 22.0

Regulation	Year	Loadcase/Workflow	PRIMER	T/HIS	D3PLOT	REPORTER (migrated to workflows)	REPORTER (standard template)
JNCAP	2018	Leg Impact					●
	2023	FFB	●	●		●	
		MDB	●	●		●	
		ODB	●	●		●	
KNCAP	2019	Leg Impact					●
	2024	FFB	●	●		●	
		MDB	●	●		●	
		Side Pole	●	●		●	
UN ECE	2015	R135 (Side Pole)	●	●		●	
	2022	R94 (ODB)	●	●		●	
	2023	R95 (Side MDB)	●	●		●	
		R137 (FFB)	●	●		●	

Crash Test Setup Enhancements

Crash Test Setup – Various

- In past versions, barriers had to be stored in a single master file. The tool now supports barriers that have a ***INCLUDE** file structure.
- The Batch Crash Test Setup tool will now write all the newly created keywords to the Master file.
- When using the Rigidwall option for rigid frontal impact load cases, the sign of the rotation angle in the ROTATE row of the ***DEFINE_TRANSFORMATION** card that rotates the Rigidwall by the impact angle, now always reflects the sign of the impact angle provided in the test settings. In past versions, the ROTATE angle was getting multiplied by -1.

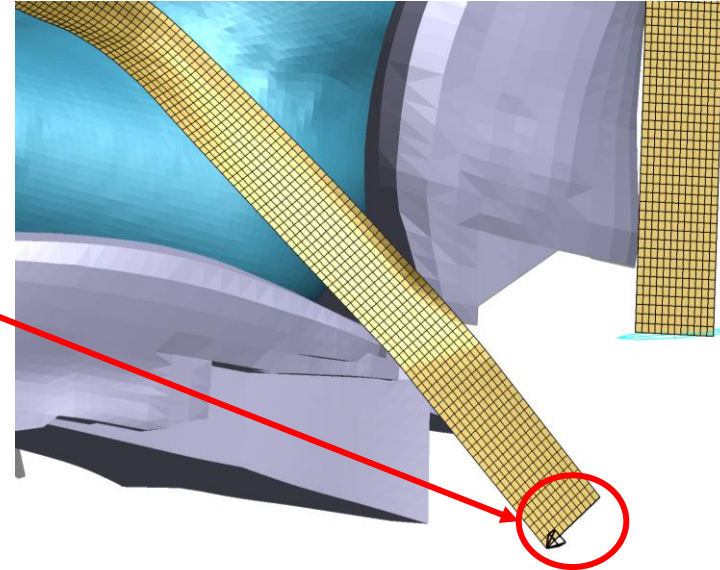
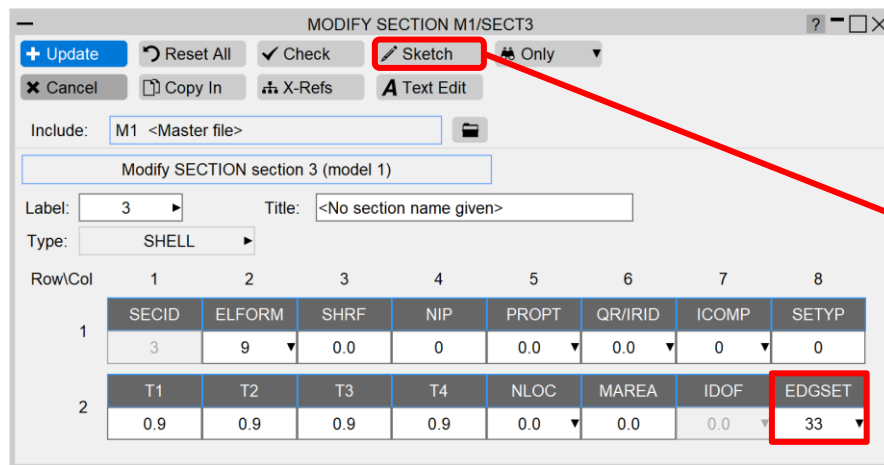


Speed and Performance

User Interface Updates

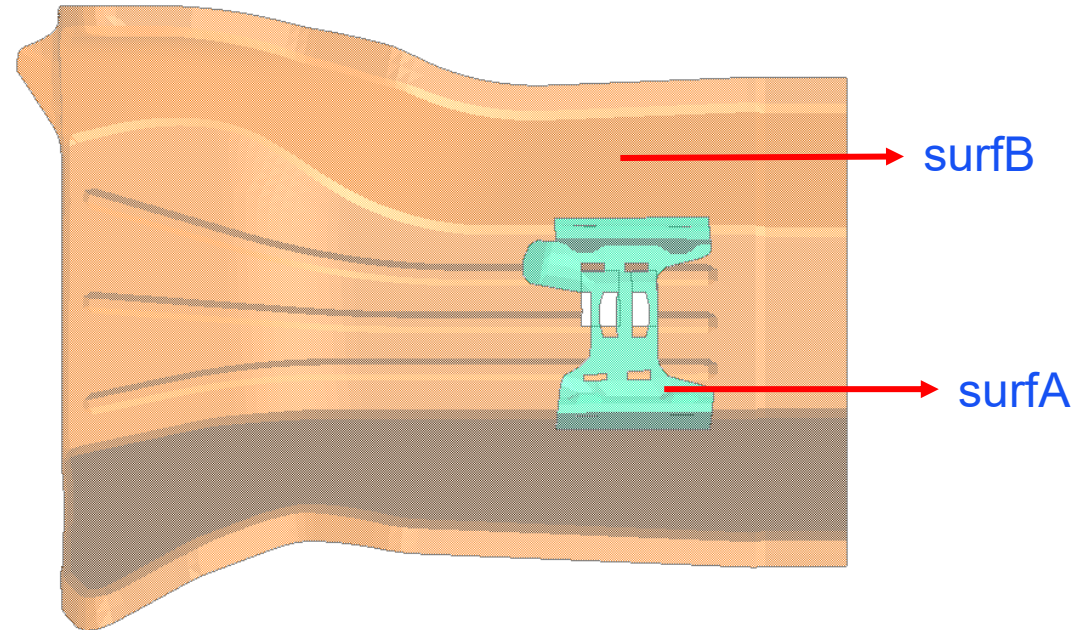
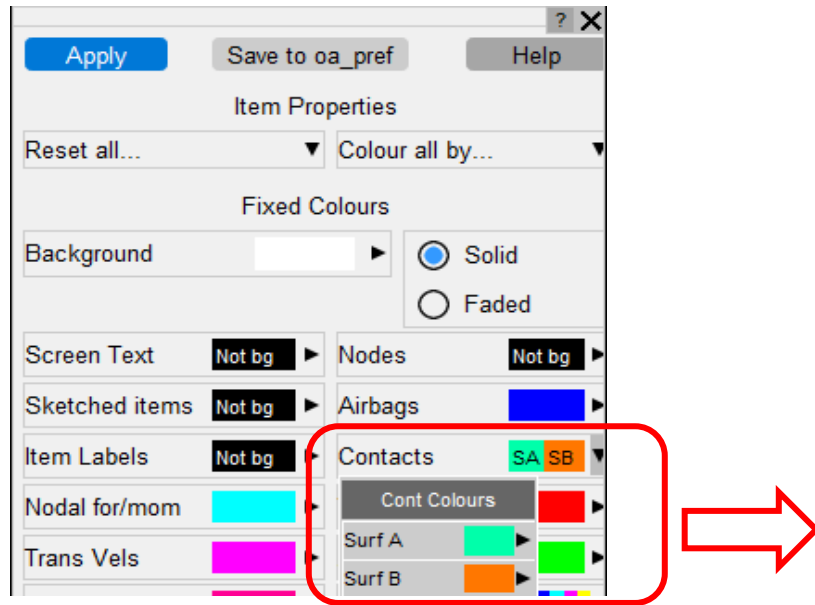
Visualising Node Sets for seatbelt keywords

- To visualise node sets on seatbelt related keywords, the sketching of the following entities has been added: ***ELEMENT_SEATBELT_SLIPRING SBRNID**, ***ELEMENT_SEATBELT_RETRACTOR SBRNID** and ***SECTION_SHELL EDGSET**.
- When these keywords are sketched, a vector is drawn from the first to the last node in the set to help visualise the direction of the node sets.



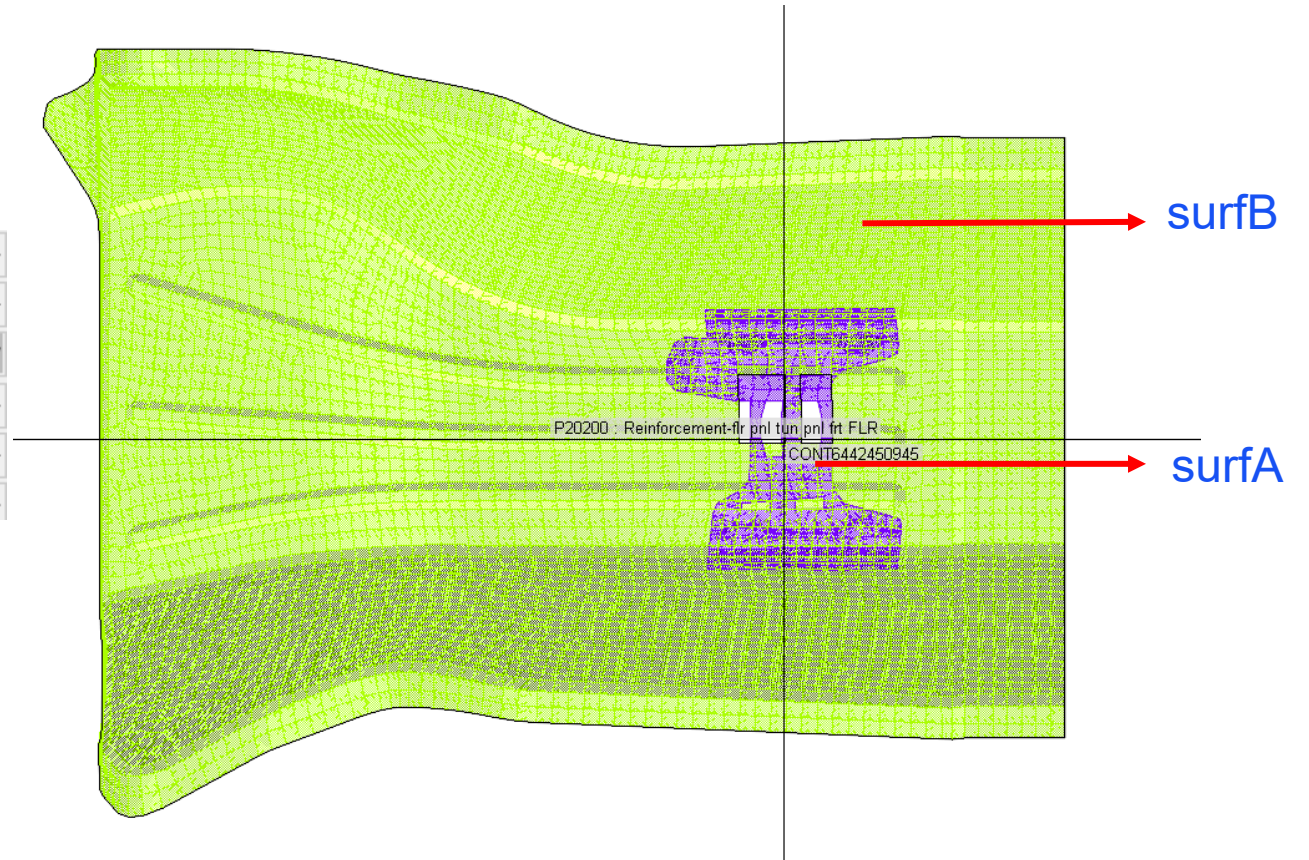
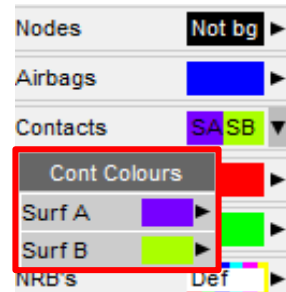
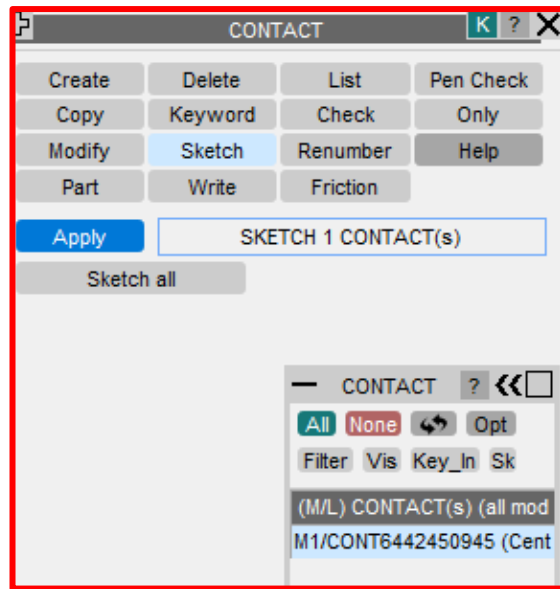
Custom colours for contact surfaces

- Added popup buttons 'surf A' and 'surf B' under Contacts in 'Display → Colour'.
- Custom colours can be set to contact surfaces using the colour palette popup for each surface.
- This helps to enhance the visual distinction between different contact regions in the model.



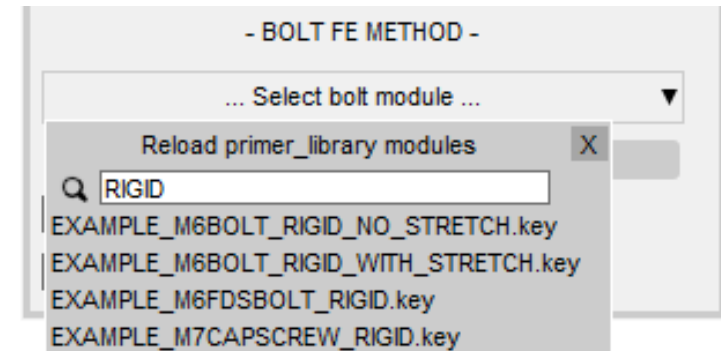
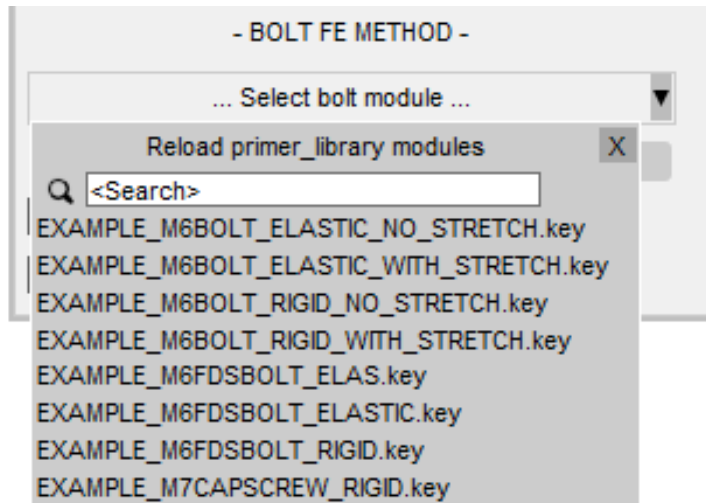
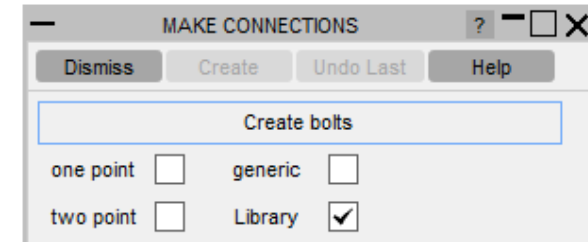
Custom sketching colours for contact surfaces

- In addition to setting custom colours for surf A and surf B, the same popup buttons under 'Contacts' in 'Display → Colour' are used for contact sketching.



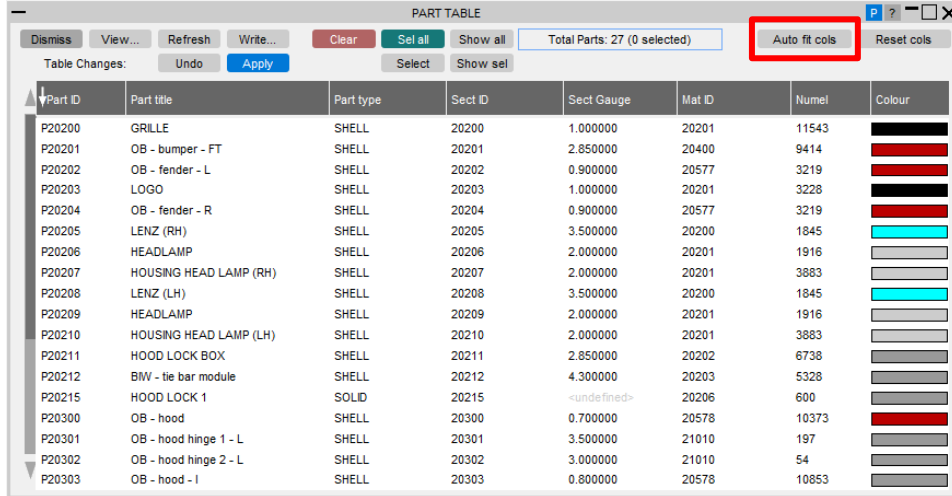
New search to filter drop down options

- A search text box has been added to the 'Select bolt module' drop down when creating bolt connections from a library.
- In previous versions if the bolt library was large, finding the required bolt could be difficult.
- In PRIMER 22.0, pattern matching filters the drop down list based on what has been typed in the new text box making finding required bolts easy.



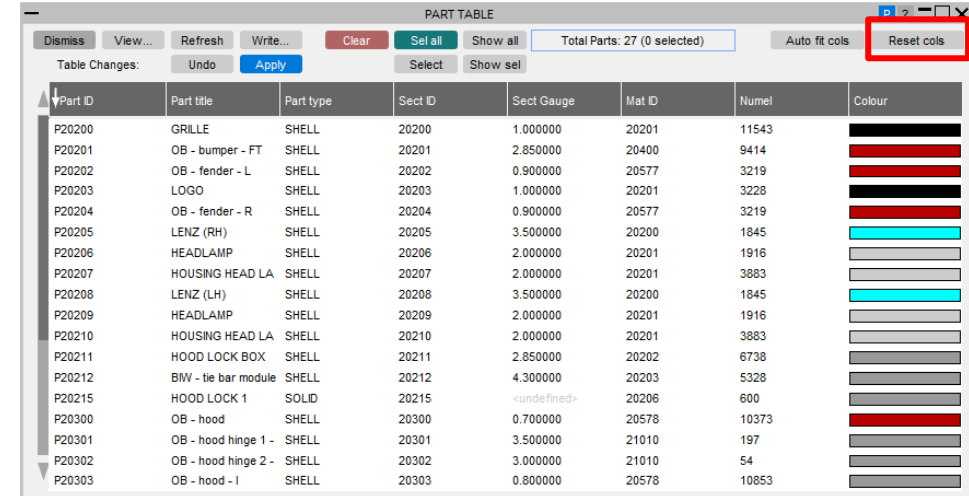
Automatically resize Part Table columns to fit content

- Columns in the Part Table and Part Compare Table can be resized by clicking on the edge of a column header and dragging the mouse.
- To make it easier to view content in a column, it is now possible to automatically resize a column to fit its widest content by double-clicking on the right-hand edge of the column header.
- Additionally, similar to the Keyword Editor, there are now two buttons, one to automatically resize all visible columns to best fit their content and one to reset the size of all columns back to be equal.



The screenshot shows the 'PART TABLE' window with a toolbar at the top. The 'Auto fit cols' button is highlighted with a red box. The table below contains 8 columns: Part ID, Part title, Part type, Sect ID, Sect Gauge, Mat ID, Numel, and Colour. The data is organized into rows for various parts, with some cells containing numerical values and others containing text descriptions.

Part ID	Part title	Part type	Sect ID	Sect Gauge	Mat ID	Numel	Colour
P20200	GRILLE	SHELL	20200	1.000000	20201	11543	
P20201	OB - bumper - FT	SHELL	20201	2.850000	20400	9414	
P20202	OB - fender - L	SHELL	20202	0.900000	20577	3219	
P20203	LOGO	SHELL	20203	1.000000	20201	3228	
P20204	OB - fender - R	SHELL	20204	0.900000	20577	3219	
P20205	LENZ (RH)	SHELL	20205	3.500000	20200	1845	
P20206	HEADLAMP	SHELL	20206	2.000000	20201	1916	
P20207	HOUSING HEAD LAMP (RH)	SHELL	20207	2.000000	20201	3883	
P20208	LENZ (LH)	SHELL	20208	3.500000	20200	1845	
P20209	HEADLAMP	SHELL	20209	2.000000	20201	1916	
P20210	HOUSING HEAD LAMP (LH)	SHELL	20210	2.000000	20201	3883	
P20211	HOOD LOCK BOX	SHELL	20211	2.850000	20202	6738	
P20212	BMW - tie bar module	SHELL	20212	4.300000	20203	5328	
P20215	HOOD LOCK 1	SOLID	20215	<undefined>	20206	600	
P20300	OB - hood	SHELL	20300	0.700000	20578	10373	
P20301	OB - hood hinge 1 - L	SHELL	20301	3.500000	21010	197	
P20302	OB - hood hinge 2 - L	SHELL	20302	3.000000	21010	54	
P20303	OB - hood - I	SHELL	20303	0.800000	20578	10853	



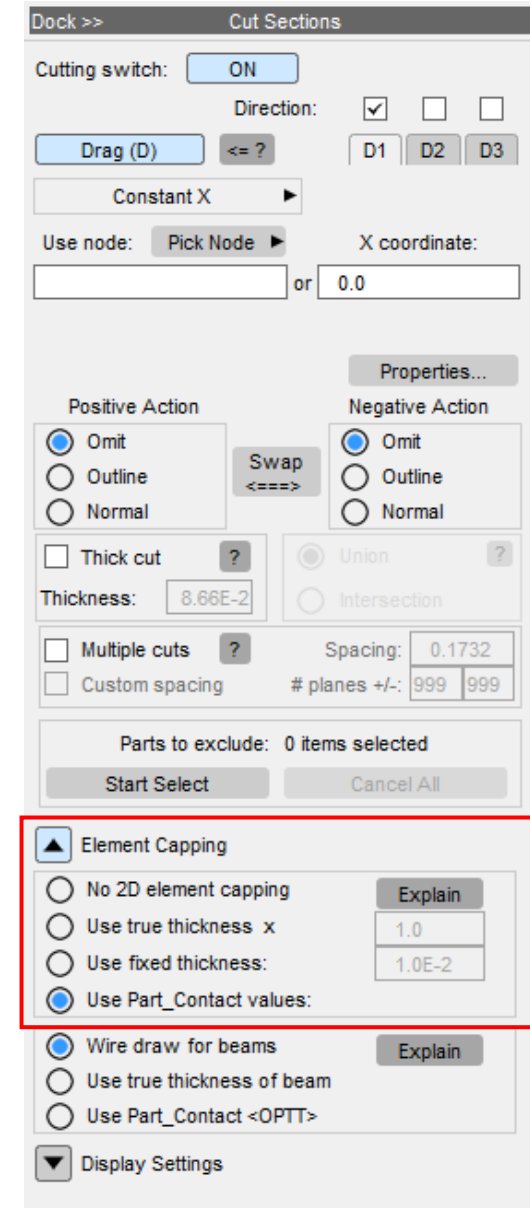
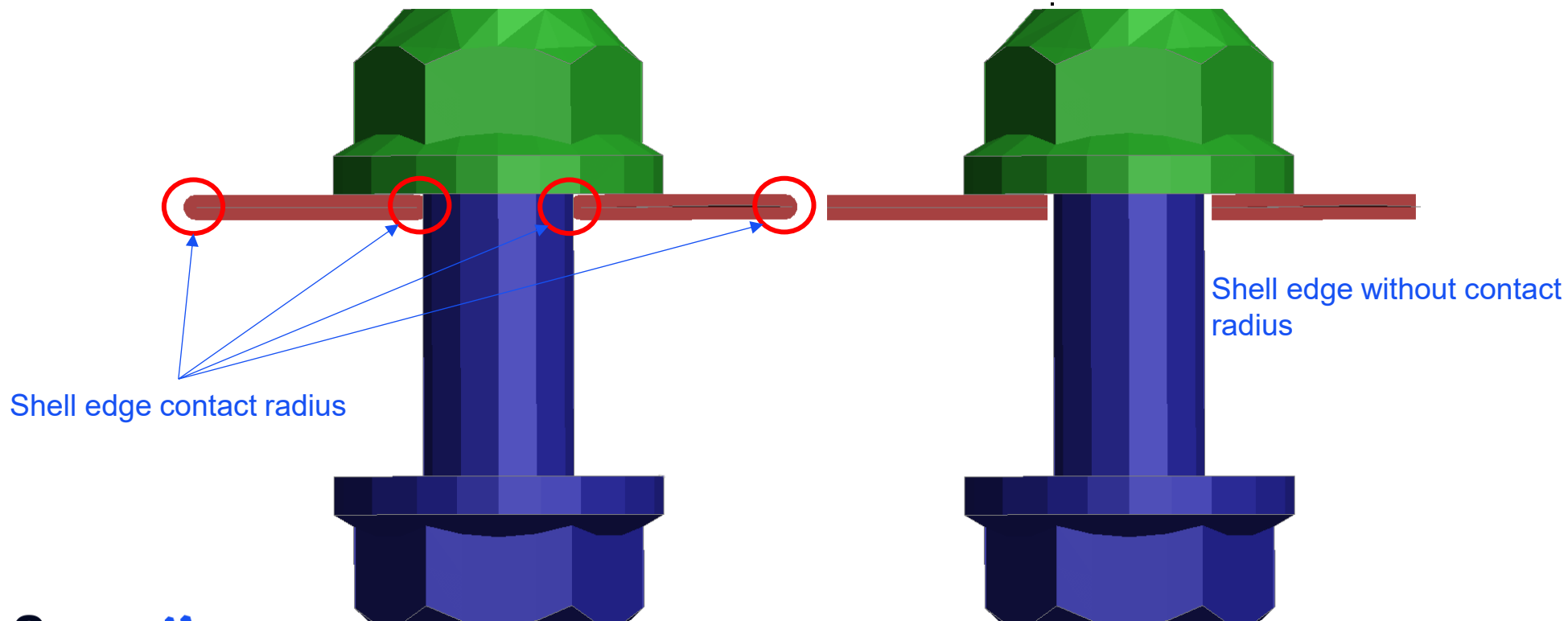
The screenshot shows the 'PART TABLE' window with a toolbar at the top. The 'Reset cols' button is highlighted with a red box. The table below contains 8 columns: Part ID, Part title, Part type, Sect ID, Sect Gauge, Mat ID, Numel, and Colour. The data is organized into rows for various parts, with some cells containing numerical values and others containing text descriptions.

Part ID	Part title	Part type	Sect ID	Sect Gauge	Mat ID	Numel	Colour
P20200	GRILLE	SHELL	20200	1.000000	20201	11543	
P20201	OB - bumper - FT	SHELL	20201	2.850000	20400	9414	
P20202	OB - fender - L	SHELL	20202	0.900000	20577	3219	
P20203	LOGO	SHELL	20203	1.000000	20201	3228	
P20204	OB - fender - R	SHELL	20204	0.900000	20577	3219	
P20205	LENZ (RH)	SHELL	20205	3.500000	20200	1845	
P20206	HEADLAMP	SHELL	20206	2.000000	20201	1916	
P20207	HOUSING HEAD LA	SHELL	20207	2.000000	20201	3883	
P20208	LENZ (LH)	SHELL	20208	3.500000	20200	1845	
P20209	HEADLAMP	SHELL	20209	2.000000	20201	1916	
P20210	HOUSING HEAD LA	SHELL	20210	2.000000	20201	3883	
P20211	HOOD LOCK BOX	SHELL	20211	2.850000	20202	6738	
P20212	BMW - tie bar module	SHELL	20212	4.300000	20203	5328	
P20215	HOOD LOCK 1	SOLID	20215	<undefined>	20206	600	
P20300	OB - hood	SHELL	20300	0.700000	20578	10373	
P20301	OB - hood hinge 1 -	SHELL	20301	3.500000	21010	197	
P20302	OB - hood hinge 2 -	SHELL	20302	3.000000	21010	54	
P20303	OB - hood - I	SHELL	20303	0.800000	20578	10853	

Contact Penetration

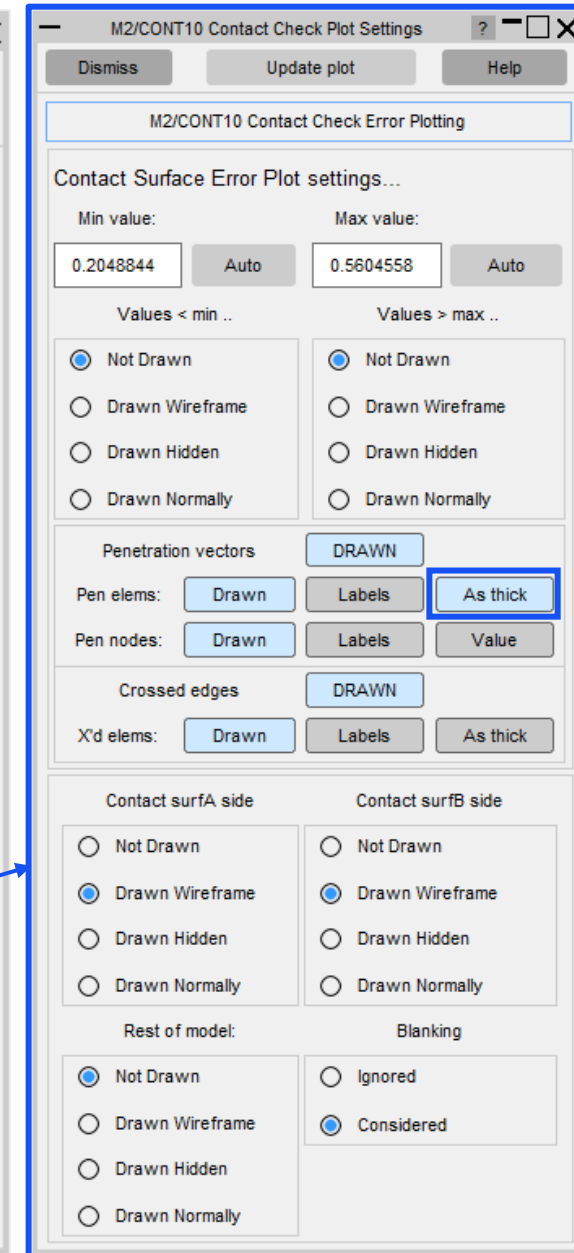
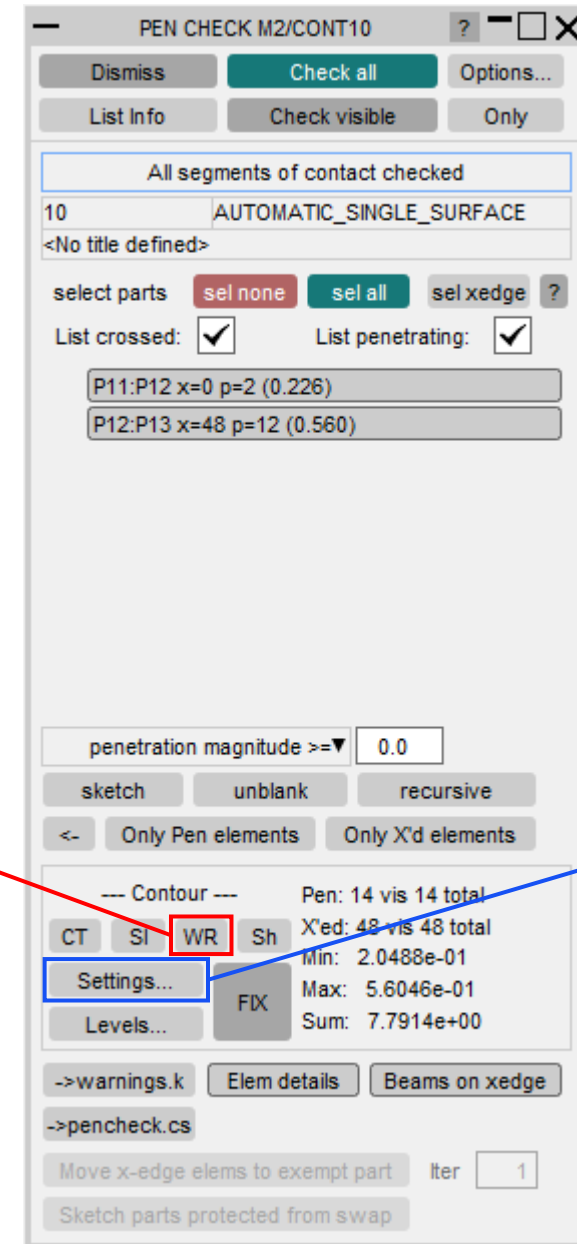
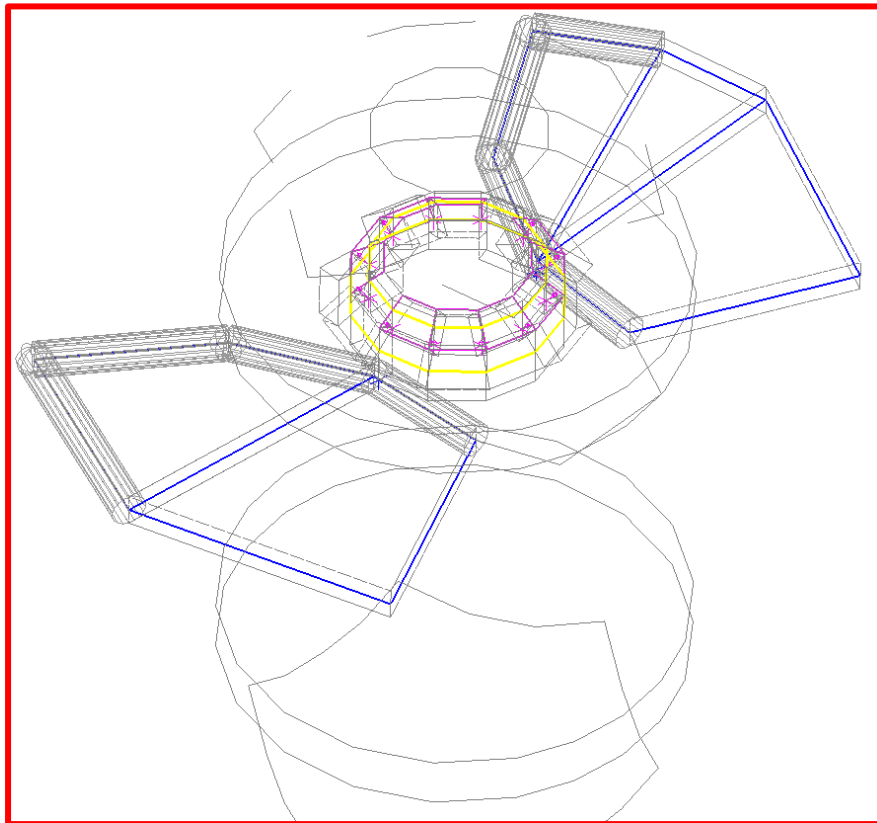
Contact Penetration

- A cap is drawn with a radius equal to one-half the contact thickness to display automatic contact wrapping around the shell edge when “Use Part_Contact values” is used in cut-sections.
- The capping is always drawn assuming an orthogonal cut. Also, currently the capping visualisation is applied to all contacts. However, in Ansys LS-DYNA this only applies to AUTOMATIC type contacts. Furthermore, at present *SHLEDG* is not considered.



Contact Penetration

- This can also be visualised through CONTACT → Penetration Check → WR.
- Set the penetration elements to be drawn “As thick” under contour setting. Plot a wireframe contour plot.



Speed and Precision Improvements

Faster create of NRBs/JOINTS in large model with S_NO general

- Models with complex set definitions (such as Set Node General defined with box) build set caches to store set contents on a short term basis.

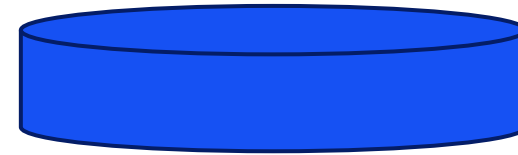
***SET_NODE_GENERAL**

Very complex definitions
involving Boxes, Parts, etc.
Slow to use in raw form.



Internal set cache

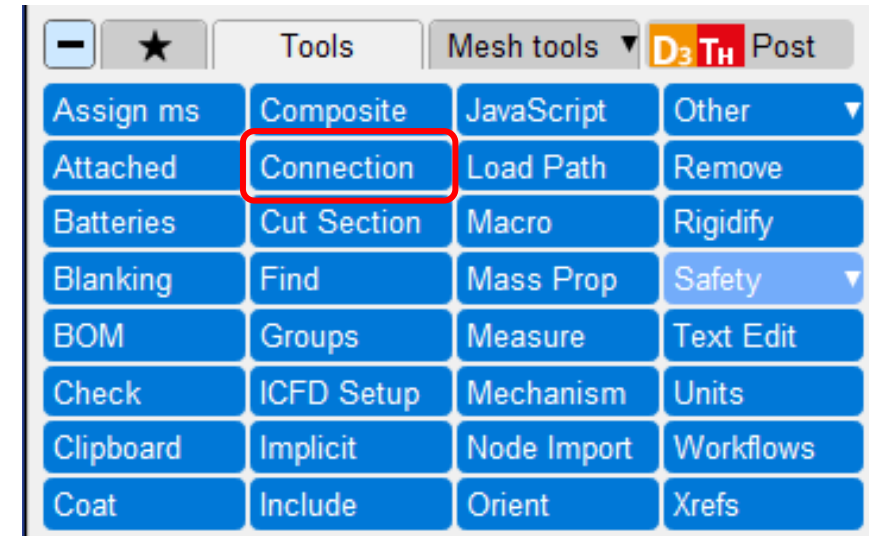
Very fast to use once created.



- These caches are used to speed up internal operations, but they must be rebuilt when the model “data_changed” status indicates they are out of date. Rebuilding them can be slow.
- Create of NRB/JOINT performs operations which mark the model as “changed” which, in turn, mark the set cache as being out of date. This used to cause of lot of churning, slowing down creation in large models.
- In PRIMER 22.0 bypassing the update of set caches in this special case makes the creation process much faster without compromising data.

Speeded up connections tool

- Repeated use of the connections tool could be very slow for a model in which welds are connected by Nodal Rigid Bodies.
 - The main connection tool resolves existing MAT100 welds without connections.
 - This runs a contact check operation to get the layers correct, which is an expensive operation.
 - If all welds resolve, subsequent actions using the connection tool are fast because no further checking is done.
 - However, welds attached by Nodal Rigid Bodies do not resolve meaning that any further use of the Connections tool reran a contact check, which was slow and pointless because the results would not change.
- In PRIMER 22.0 this special case is detected and the “attached” welds no longer trigger 2nd and subsequent contact checks.
- This makes the Connections tool much faster to use in this situation.

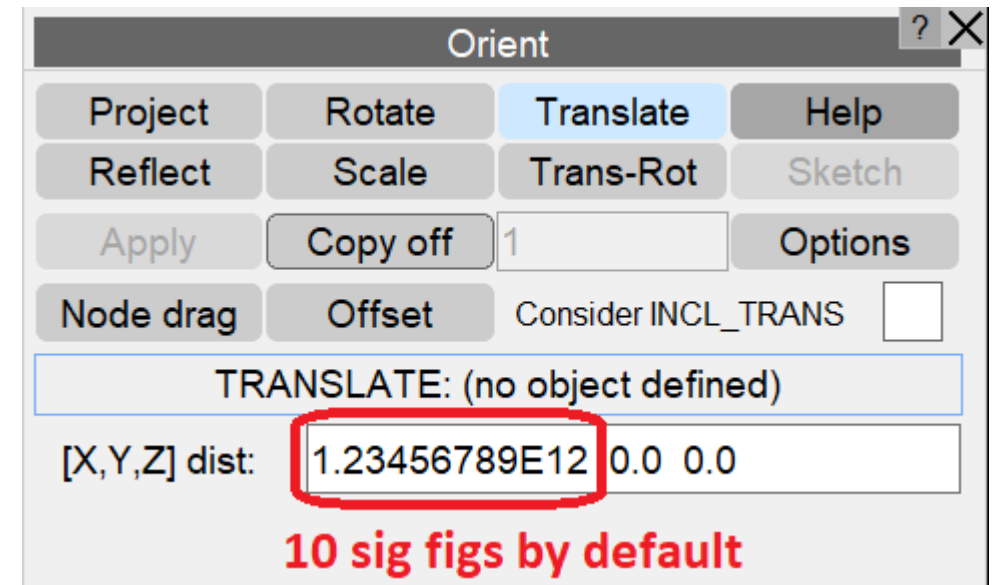


Improvements for very large models

- We have had the opportunity to work on a “Gigacasting” project during this development cycle, a model with 330 million elements and 70 million nodes. PRIMER handled this but it demonstrated some areas where performance was slow, so the following improvements have been made:
 - The graphics cache, used to redraw models, now uses longer data vectors in GPU memory by default, although this is configurable. This makes better use of high-performance graphics cards, no longer throttling their performance.
 - Screen-picking has been speeded up somewhat for elements and considerably for nodes.
- We will continue to make further incremental improvements in performance of very large models.

ORIENT panel now uses double precision for input

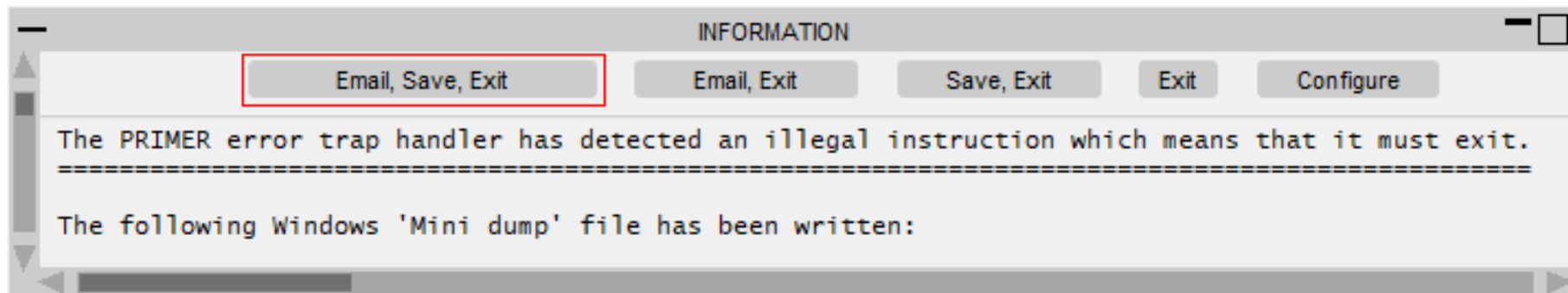
- In PRIMER 21.0 internal nodal coordinate storage and all transformations for operations such as ***INCLUDE_TRANSFORM** was switched from single to double precision. However, the ORIENT panel continued to use single precision for most interactive input. This limited the resolution of interactively defined transformations to approximately 7 significant figures.
- In PRIMER 22.0 all input in the ORIENT panel is now double precision and all the underlying transformations are now also performed in double precision, giving approximately 15 significant figures of resolution.
- The default output resolution for double precision numbers in interactive GUI buttons is 10 sig figs, this can be controlled under **Program options, Precision**.



Email Minidump Files

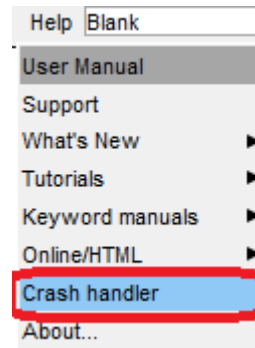
Windows Minidump files can now be emailed

- Following a crash on Windows a “minidump” file is created which, if sent, can sometimes enable us to diagnose the cause of the crash, suggest workarounds and fix the bug. Historically this file has been written to an obscure temporary directory making it laborious to extract and send it.
- PRIMER can now:
 - Compose an email automatically, attaching the minidump file.
 - Include further information about the crash (stack trace) in that email.
 - Launch the default email handler on the system so that you can add further information if you wish.
- This email is ***not*** sent automatically, you can choose to send it or not.
- Composition of these emails is optional; they can be turned off.

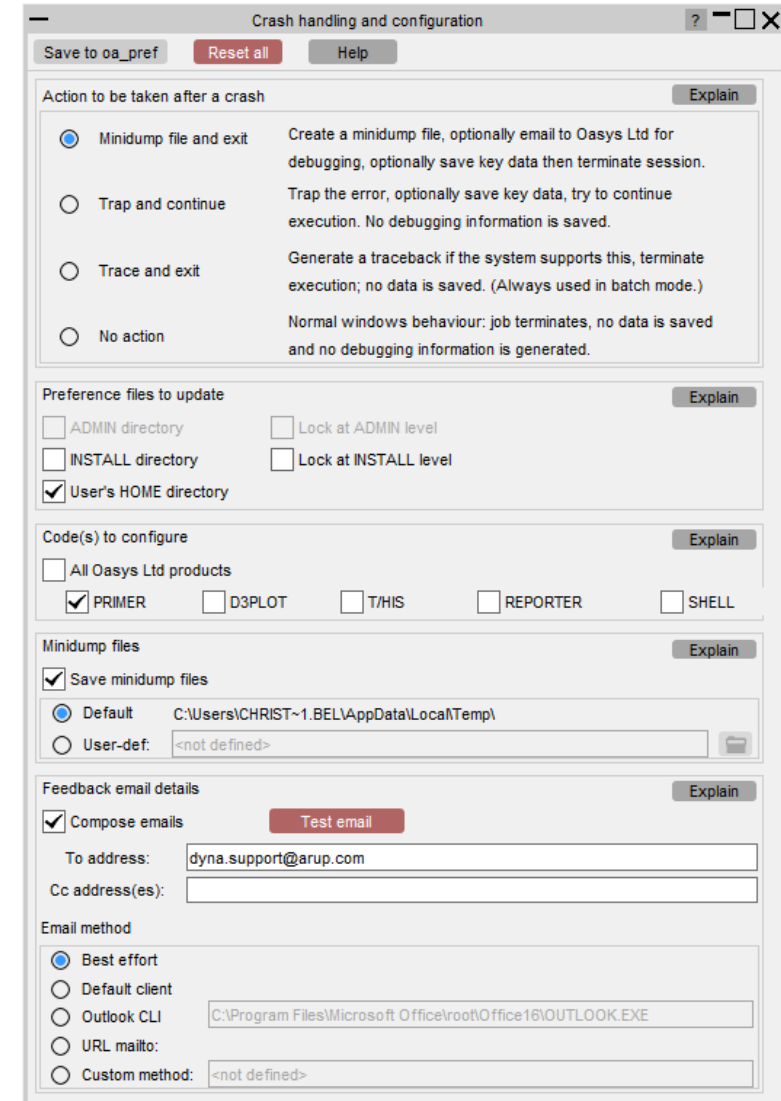


Windows Minidump files can now be emailed (continued)

- Minidump files and crash handling generally can be configured by preferences, but to make this easier there is now an interactive GUI which can be used to control this behaviour:



- Crash dump behaviour can also be configured at the “admin” or “installation” levels during software installation, configuring it for all users.



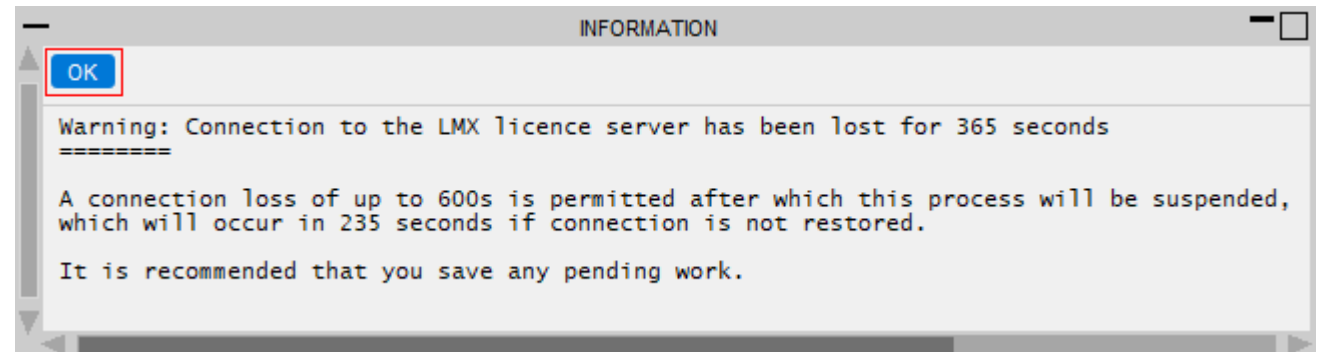
Improved LMX server connection
loss behaviour (V22.1 onwards)

Improved LMX server connection loss behaviour (V22.1)

Oasys Ltd software uses the LMX licensing system which requires connection to a licence server when the software first starts. It also maintains regular contact with that server during the session to enable the server to keep track of usage. If contact with the server is lost for more than approximately 10 minutes the behaviour in versions before V22.1 was to terminate the session.

This has been changed from V22.1 onwards so that the session is suspended rather than terminated. When connection with the licence server is regained it will continue as before, or alternatively the user can choose to terminate it. The process now works as follows:

After approximately 6 minutes of server connection loss a warning message will appear:



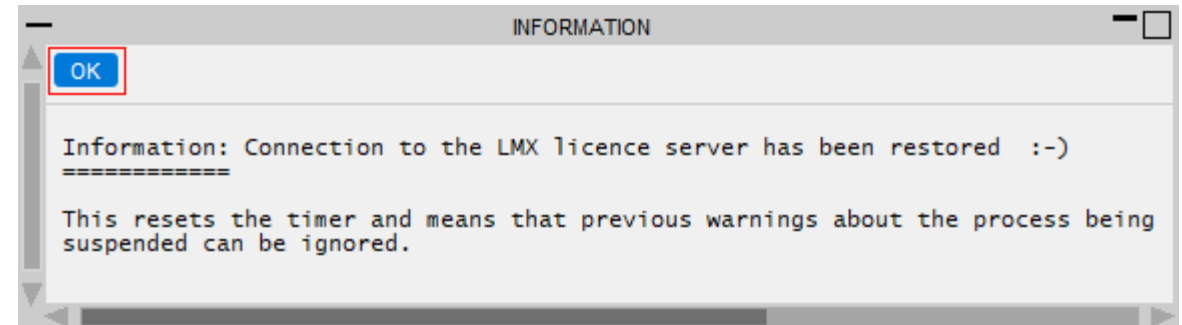
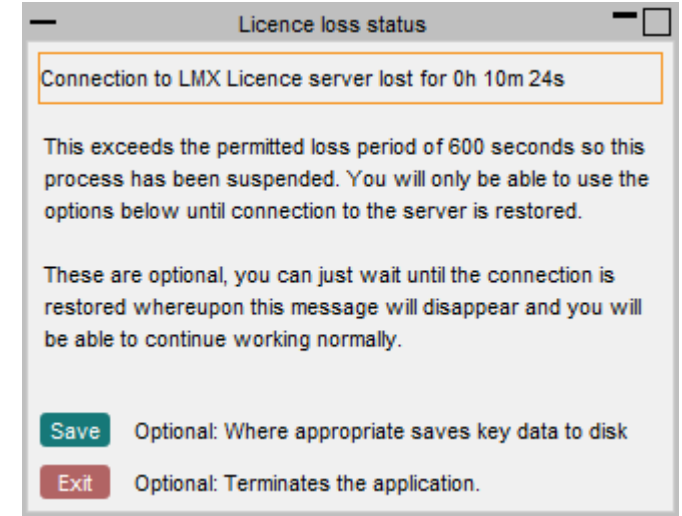
Improved LMX server connection loss behaviour (V22.1)

This message will be updated at approximately one minute intervals, giving the time remaining, until the limit of ten minutes is reached. During this period PRIMER will operate normally.

When ten minutes of licence loss have elapsed it will be replaced with this dialogue. The PRIMER session will remain live but “frozen” so that no further work can be done. No data will be lost.

The user can just wait and do nothing, or **Save** all models to disk and continue to wait for the licence connection to be restored, or **Exit** normally.

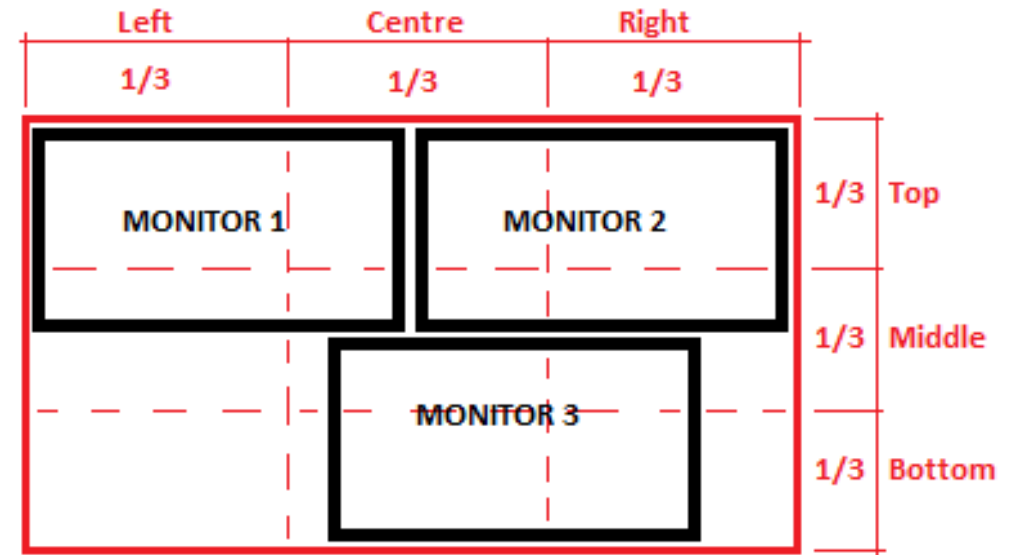
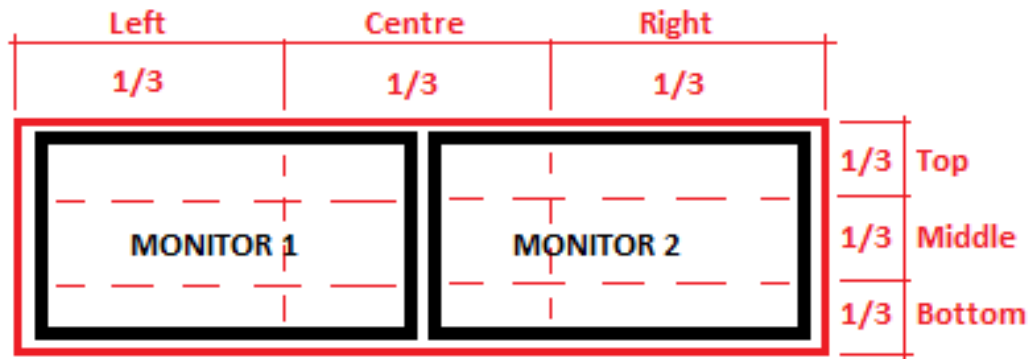
If the licence server connection is restored this panel will disappear, this confirmation message will be shown and PRIMER will resume working normally.



Initial Window Placement

Master PRIMER window can start on a selected monitor

- On a multi-monitor desktop the “placement” preference can be used to select which of multiple monitors on a desktop the master PRIMER window starts in. Previously this was always the main display window. The bounding box (red) around the monitors (black) that make up the desktop in pixel space which is divided into 1/3rds. For example:



- The preference value may be a combination of
LEFT | CENTRE | RIGHT
and / or
TOP | MIDDLE | BOTTOM

The monitor nearest to the centre of that 1/3rd sub-area is used.

Flexible Automation and Integration

Updates to both
JavaScript and Python APIs

Updates to both JavaScript and Python

- It is no longer necessary to specify the memory required when running a script. The memory is now automatically increased as required.
- The GetAll and GetFlagged methods available for keyword classes can now take an optional argument, which is a property from the object to return in the array, instead of the object itself.
- A new AllItems method has been added to the Set class that returns all of the items in a set (after decomposing any special set definitions) as an array. This matches the method in D3PLOT and is an alternative to spooling the set.

Updates to both JavaScript and Python

- Static GetTargetEye and SetTargetEye methods have been added to the View class to enable getting/setting the target and eye position.
- Added SetAssemblyPart, SetAssemblyPartSet and SetAssemblyNodeSet to the Dummy class.

JavaScript and Python API: Attached.SetEntity

- In the Attached class, the Attached.SetEntity method now allows users to toggle entities on or off for the find attached function. Previously, users had to manually switch each entity on or off. With the PRIMER v22.0 release, it is possible to select all entities or all constrained entities using “ALL” or “CONSTRAINEDALL” as the type argument.

- Switching on and off all entities:

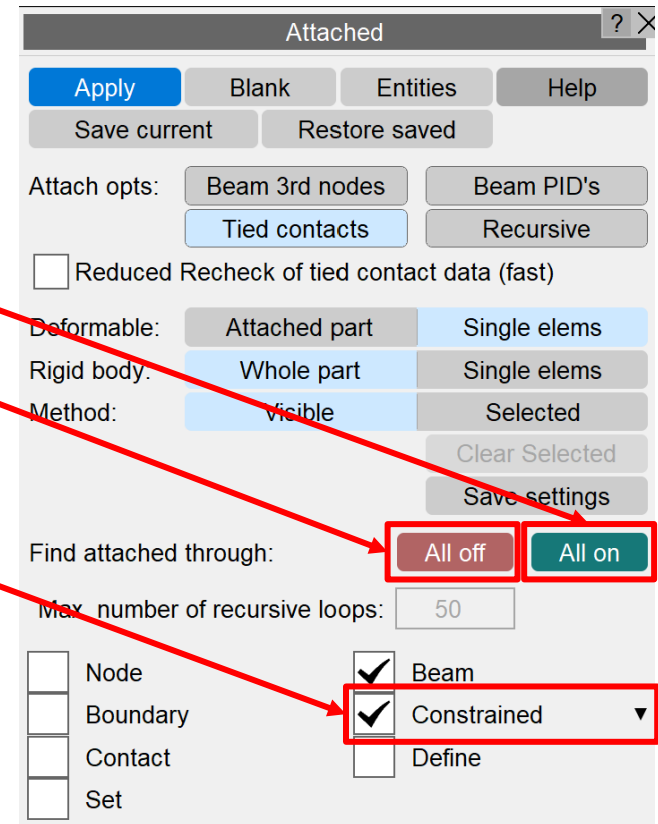
```
Attached.SetEntity("ALL", true)
```

```
Attached.SetEntity("ALL", false)
```

- Switching on and off all constrained entities:

```
Attached.SetEntity("CONSTRAINEDALL", true)
```

```
Attached.SetEntity("CONSTRAINEDALL", false)
```



JavaScript specific updates

JavaScript API

- The function assigned to the Window onClose event can now return false to prevent the window closing if required.

Python specific updates

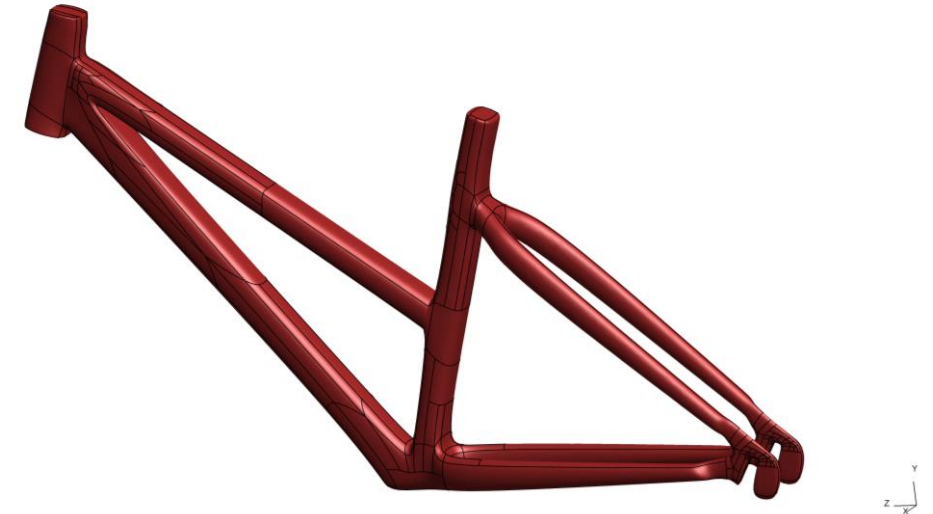
Python API

- The GetAll and GetFlagged methods available for keyword classes now work for very large lists. In PRIMER 21.0 there was a limit of ~300,000 items.
- Scripts which garbage collect and reuse lots of objects should now be significantly faster.

Isogeometric Analysis (IGA)

*IGA – Visualisation

- ***IGA_SOLIDS** are now rendered, allowing for visualisation and graphical picking.
- Parametric trim faces (***IGA_FACE_UVWs**) and parametric trim edges (***IGA_EDGE_UVWs**), for parent ***IGA_SOLIDS** and ***IGA_SHELLS** can also be visualised.
 - Drawing of these entities need to be turned on via the entities panel.
- Following a change to an ***IGA** entity that could affect the geometry of the parent ***IGA_SHELL** or ***IGA_SOLID** the graphics of the affected entities will be automatically re-rendered.



ENTITIES

?

×

Dismiss

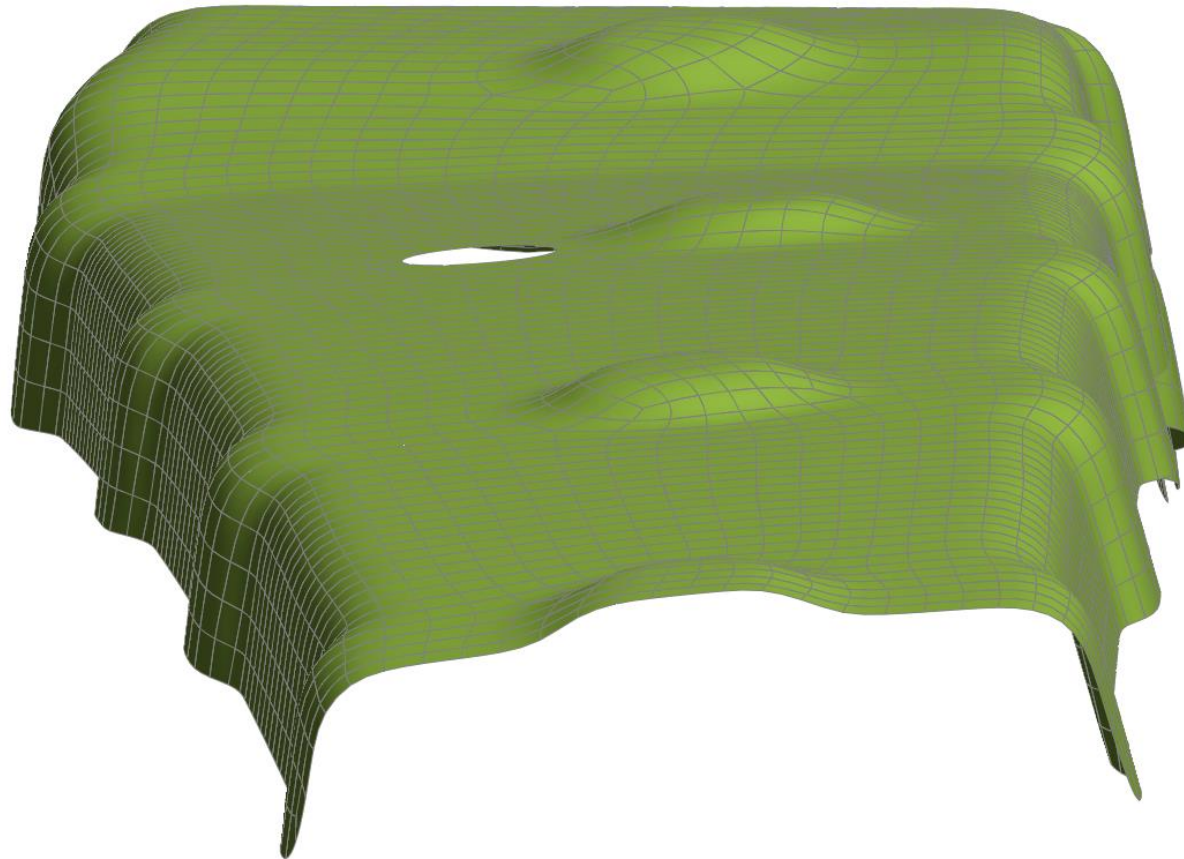
Update

Help

Type	Name	Label	Drawn	Type	Name	Label	Drawn
ALL TYPES							
ELEMENTS...	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	IGA_1D_BREP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AIRBAG...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	IGA_EDGE_UVW	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ALE...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	IGA_FACE_UVW	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BOUNDARY...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	IGA_POINT_UVW	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CONNECTION	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	IGA_SHELL	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
CONSTRAINED.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	IGA_SOLID	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
CONTACT...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
DAMPING...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
DATABASE...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
DEFINE...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
DEF_TO_RIG..	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
IGA..	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>				
INITIAL...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
INTERFACE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				

*IGA – Visualisation

- ***IGA_SHELL** keywords with the *BASIS_TRANSFORM* option (formerly called *BEXT*) can now be rendered, allowing for visualisation and graphical picking.



MODIFY IGA_SHELL M1/IGSH1

☒ Check

Include: M1 <Master file>

IGA_SHELL

	sid	IGFX	pid	P	nistr	Flt	niss	Flt		idfine	Lab
1	1		22		1.0		1.0				0

MODIFY IGA_FACE_XYZ M1/IGFX1

☒ Check

Include: M1 <Master file>

IGA_FACE_XYZ BASIS_TRANSFORM

	fid	Lab	patchid	G2BT	on	Int	psid	S_IU	esid	S_IE			
1	1		1		0		0		0				
Open ended lines below													
2	elid1	Lab											
	0												

MODIFY IGA_2D_BASIS_TRANSFORM_XYZ M1/IG2BT1

☒ Check

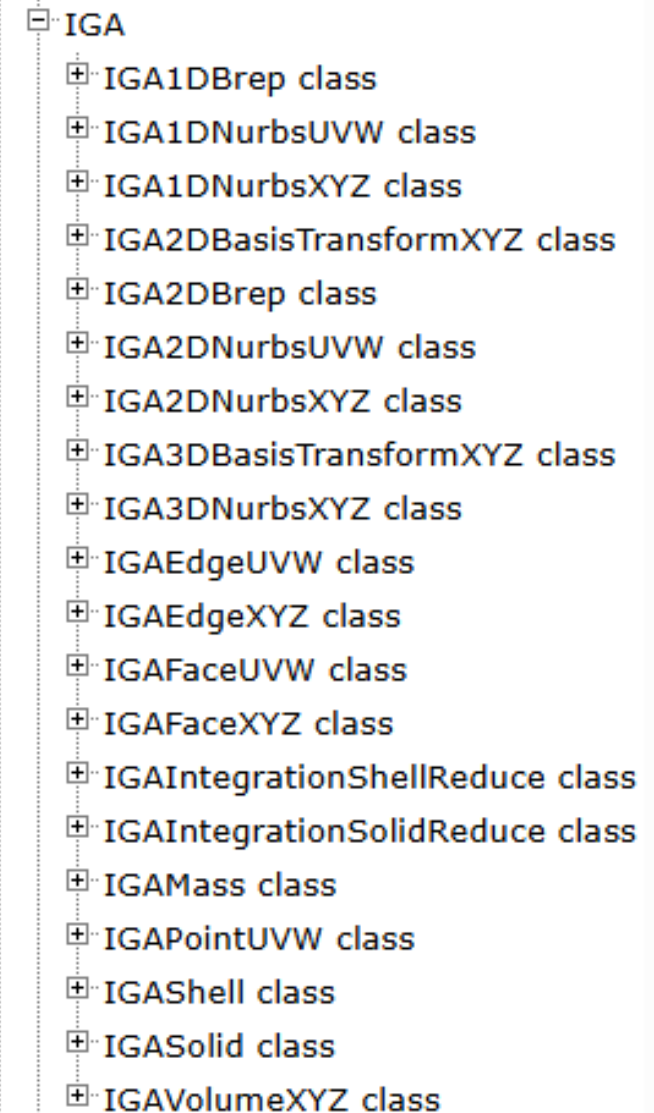
Include: M1 <Master file>

IGA_2D_BASIS_TRANSFORM_XYZ

	patchid	Lab	filename	Char
1	1		4mm_g1.k	

*IGA – API

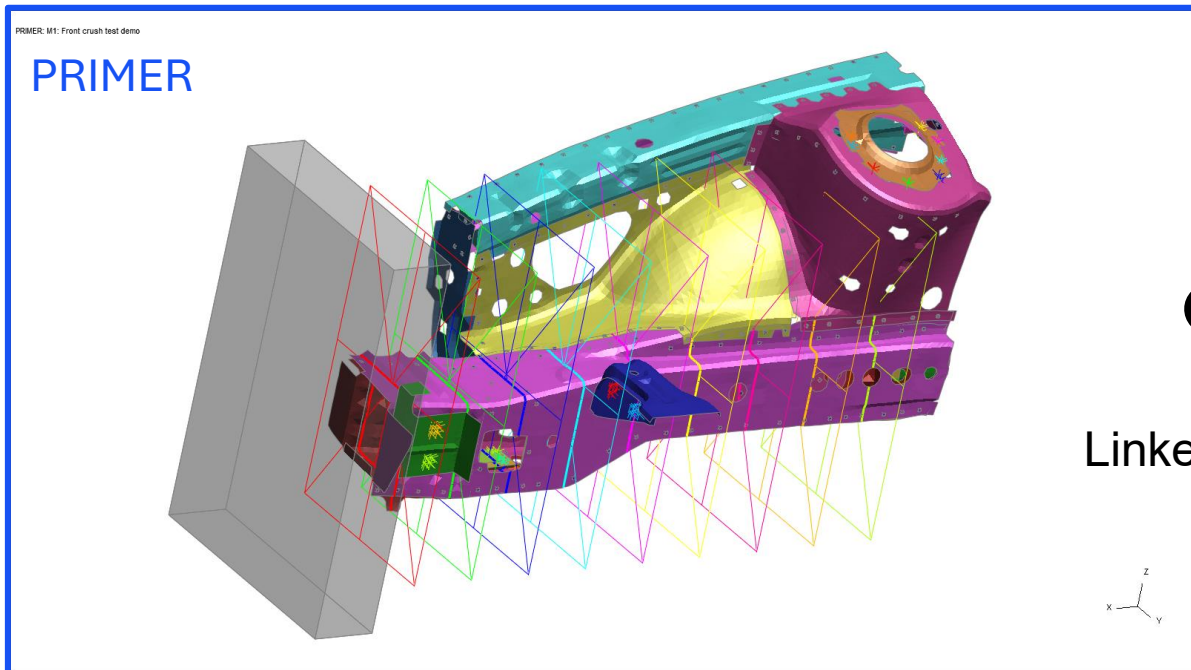
- ***IGA** keywords can now be created/edited through the **JavaScript API** and **Python API**.
- Most of the ***IGA** keywords valid from version R15 can be edited through the APIs.
- The image shows the list of the new API classes added for the ***IGA** keywords.
- Following edits made to an ***IGA** entity, via a script, the parent ***IGA_SHELL(s)** and ***IGA_SOLID(s)** can be re-rendered via `IGAShell.RedrawAll()` and `IGASolid.RedrawAll()`



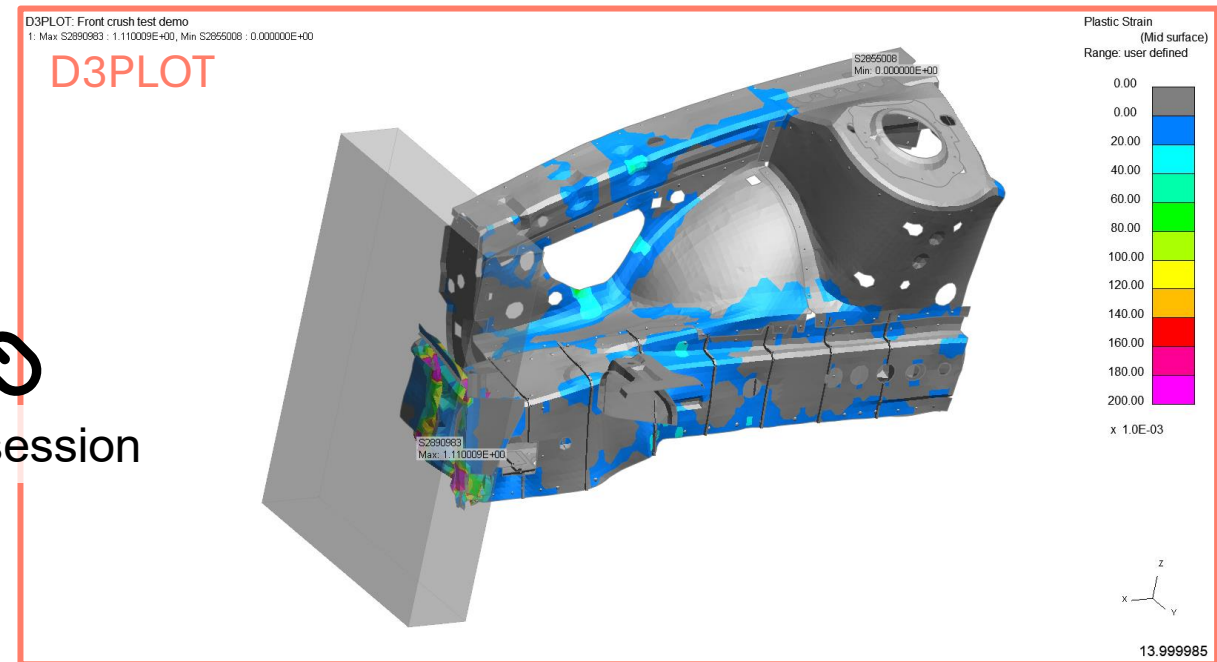
D3PLOT Link Changes

Linked D3PLOT Session Blanking Lock Behaviour

- PRIMER now preserves the blanking **Lock** status when an Unblank action is carried out in linked D3PLOT sessions (and vice versa).

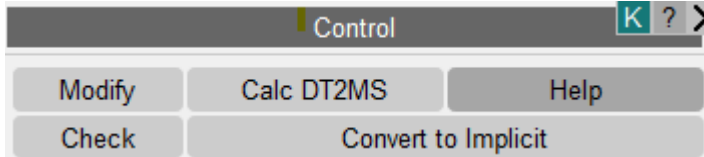


Linked session



Other Developments and Preferences

Control Calc DT2MS tool



A dialog box titled "CALC DT2MS AND %ADDED MASS" with "Dismiss", "Set DT2MS", and "Set DT2MSF" buttons. It contains the following fields:

Model Mass:	1300.058	
Current DT2MS	0.0	on *CONTROL_TIMESTEP
Model Timestep:	1.33E-3	Input required model timestep
%age added mass:	5.00%	Input required %age added mass
Target Mass:	1365.061	Input required target i.e. model mass + added mass
MAT100 <DT> mass:	0.0	?

In previous versions the model timestep can be set by specifying %age added mass.

A dialog box titled "CALC DT2MS AND %ADDED MASS" with "Dismiss", "Set DT2MS", and "Set DT2MSF" buttons. It contains the following fields:

Model Mass:	1300.058	
Current DT2MS	0.0	on *CONTROL_TIMESTEP
Model Timestep:	1.33E-3	Input required model timestep
%age added mass:	5.00%	Input required %age added mass
Target Mass:	1365.0	Input required target i.e. model mass + added mass
MAT100 <DT> mass:	0.0	?

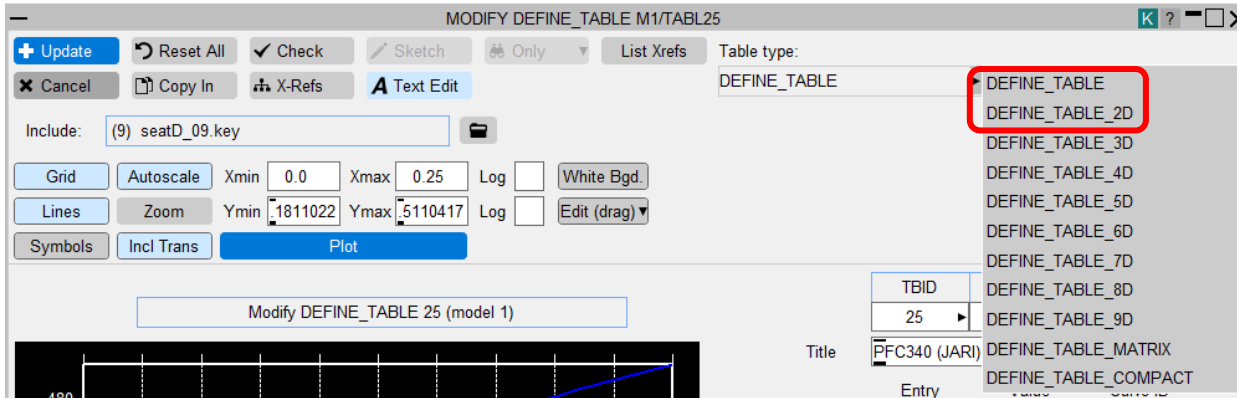
In PRIMER 22.0 the model timestep can also be set by specifying target mass which is sum of structural mass and added mass.

***DEFINE_TABLE** conversion to *_2D*

- ***DEFINE_TABLE_2D** references ***DEFINE_CURVES** by label.
- Therefore ***DEFINE_TABLE_2D** is usually preferable and easier to work with than ***DEFINE_TABLE** which must be followed by an ordered list of ***DEFINE_CURVES**.
- A new model check warns of existing ***DEFINE_TABLE**s and offers an autofix.

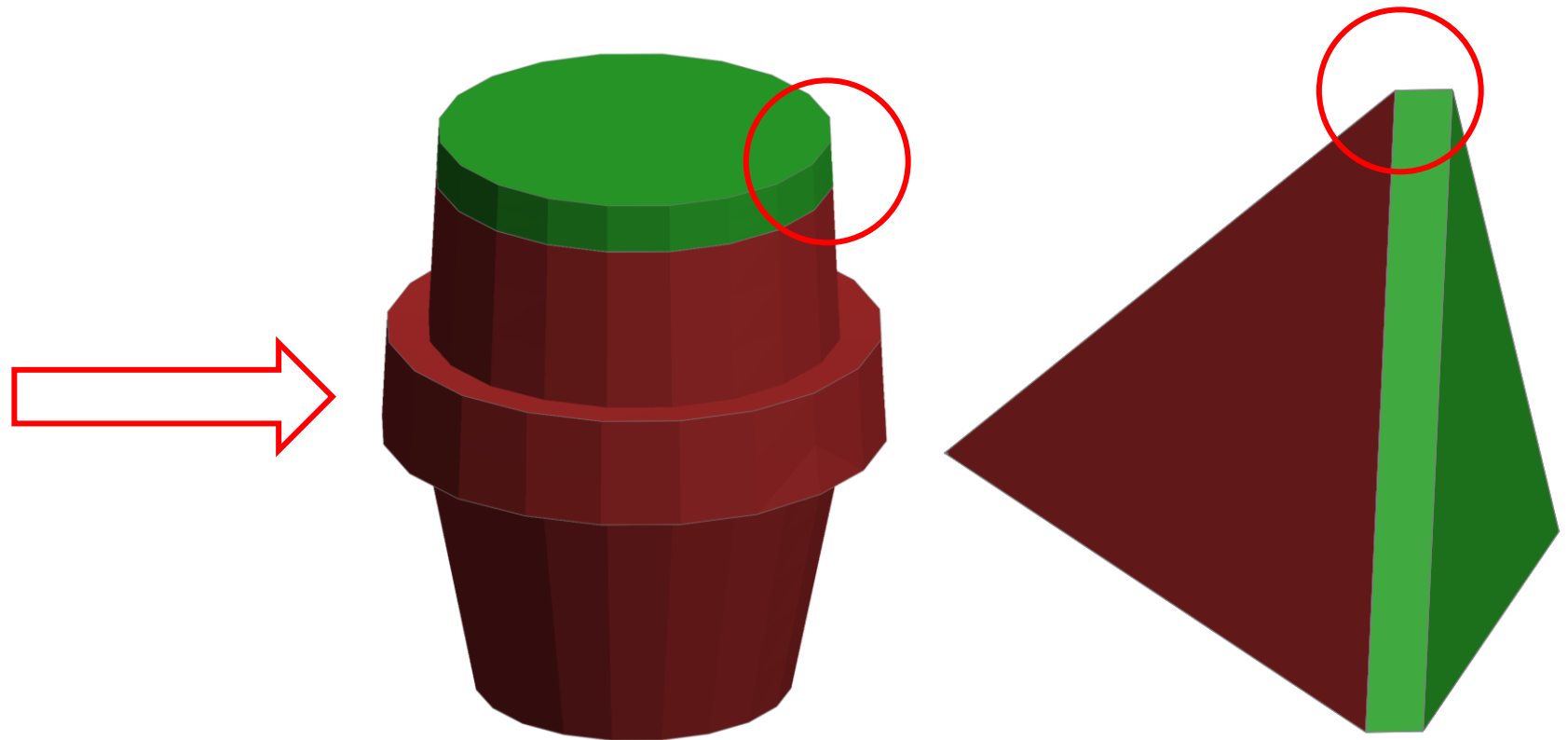
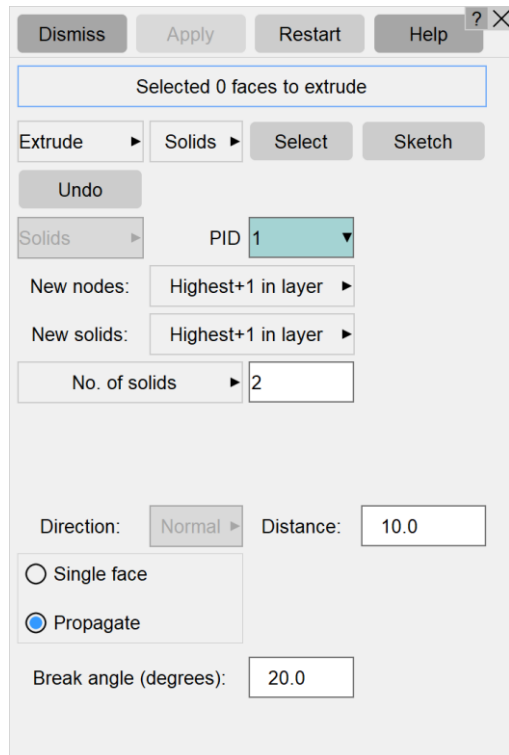
```
[-] WARNING [2]
  [-] CONTROL [1]
    [-] DEFINE_CURVE [1]
      [+ F] TABLE_<NONE> should be converted to preferred _2D : Convert *TABLE_<NONE> to _2D (1)
```

- The drop-down on the ***DEFINE_TABLE** edit panel now permits conversion to *_2D* format.



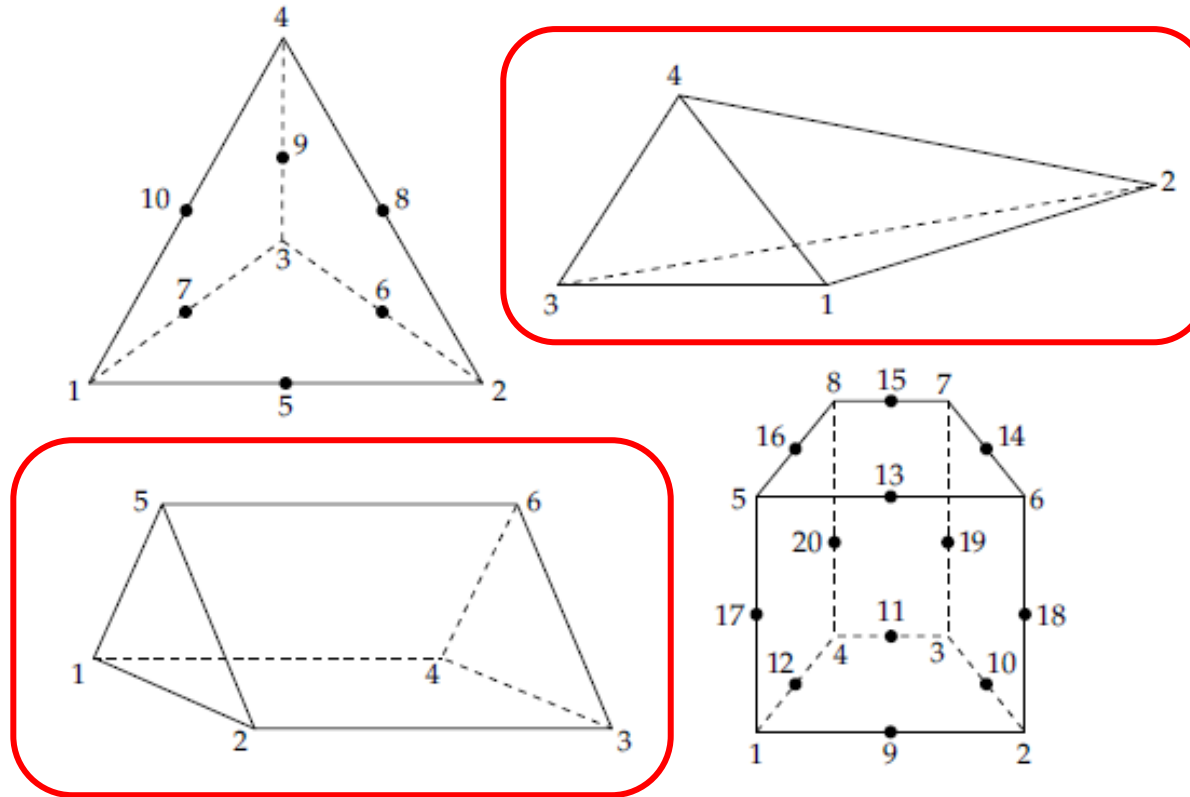
Mesh – extrude solids

- The Mesh extrude panel can now also extrude solid elements to create new solid elements. For tetrahedrons the tool will extrude exactly along the selected face normal and does not consider local faces.
- The single face option will extrude the chosen face only. Propagate will select the entire surface defined by the break angle.



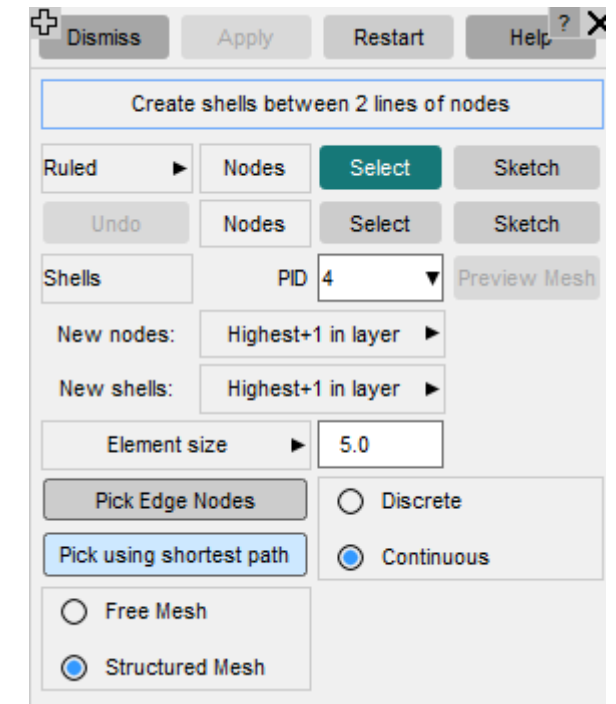
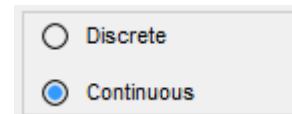
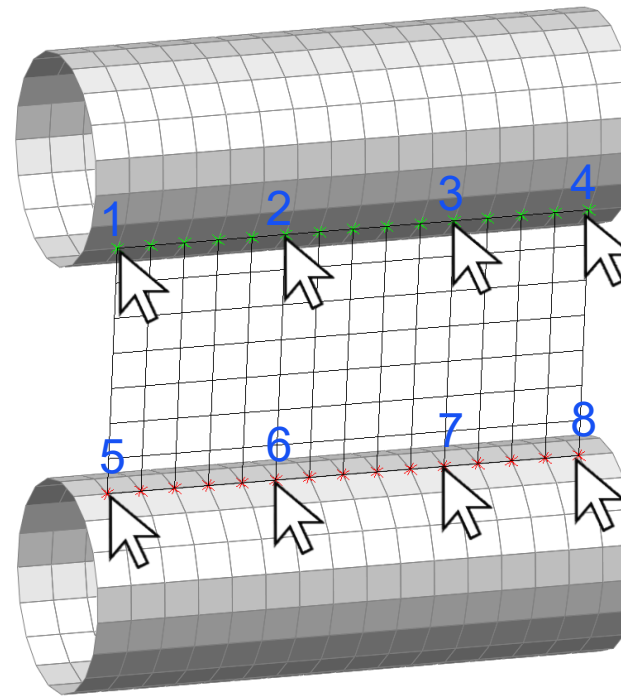
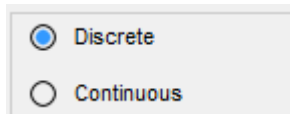
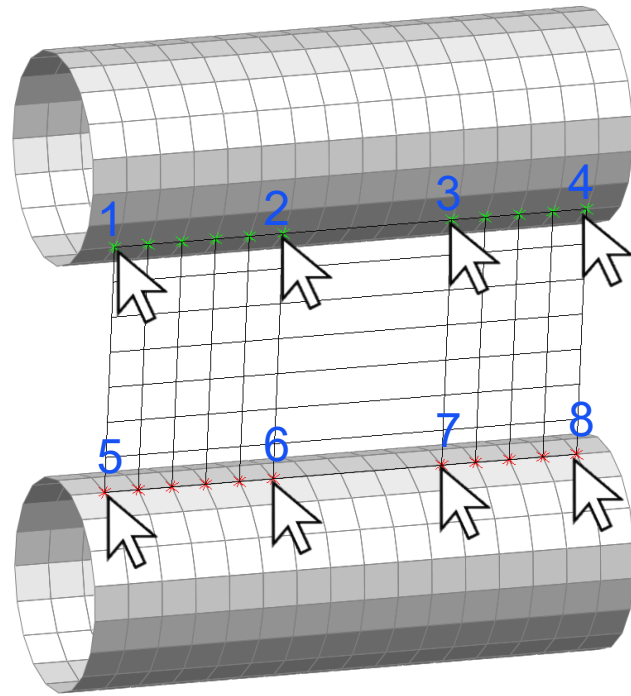
Mesh – extrude solids

- This new option is supported for up to 8 noded solids. Extrusion of higher order solids is not currently possible.



Mesh – Ruled Discrete/Continuous selection

- The Ruled Mesh panel now allows for discrete and continuous selection options when using Pick Edge Nodes or Pick using shortest path:
 - Discrete selection allows you to pick nodes in discrete lines between two nodes and automatically starts a new line to select nodes after each second click.
 - Continuous selection allows you to pick nodes in a continuous line without separation.



Parameter Expressions

- PRIMER 22.0 now supports $\text{pow}(x, y)$ as well as the previously supported format: $x^{**}y$.

The image displays three screenshots of the PRIMER 22.0 software interface, illustrating the process of modifying and editing parameter expressions.

Top Screenshot: MODIFY PARAMETER M1

This window shows a table of parameters for model 1. The parameters listed are myparam, MyPower, and MyPower2. The table includes columns for Name, Type, Value, and various flags (EXPR, LOC, MUT, TYP, NEO). The 'MyPower' parameter is highlighted, showing a value of 9.0 and the 'EXPR' flag checked.

Name	Type	Value	EXPR	LOC	MUT	TYP	NEO
myparam	R	3.0					
MyPower	R	9.0	✓				
MyPower2	R	27.0	✓				

Bottom Left Screenshot: Edit parameter M1 MyPower

This window shows the details for editing the 'MyPower' parameter. The 'Include' field is set to 'M1 <Master file>'. The 'Name' is 'MyPower' and the 'Value' is '9.0'. The 'Type' is 'R' and the '_EXPRESSION' checkbox is checked. The expression field shows 'pow(myparam, 2)'.

Bottom Right Screenshot: Edit parameter M1 MyPower2

This window shows the details for editing the 'MyPower2' parameter. The 'Include' field is set to 'M1 <Master file>'. The 'Name' is 'MyPower2' and the 'Value' is '27.0'. The 'Type' is 'R' and the '_EXPRESSION' checkbox is checked. The expression field shows 'myparam**3'.

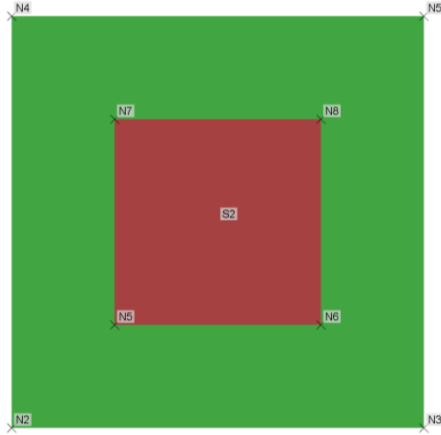
Forming tool – Interpolate shell thickness

- The forming tool maps analysis results onto another model, transferring initial thicknesses and plastic strains from a source to a target model.
- The Interpolate thickness option has been introduced to interpolate the shell thicknesses at the nodes from the matched shells in the source model, allowing for an improved shell thickness mapping.
- This feature is active by default and can be controlled using the preference:
primer*forming_shell_thickness_interpolation
or the Interpolate thickness checkbox on the panel.
- If interpolation is disabled, the tool will revert to the previous method of using the average thickness of the matched source model shells.

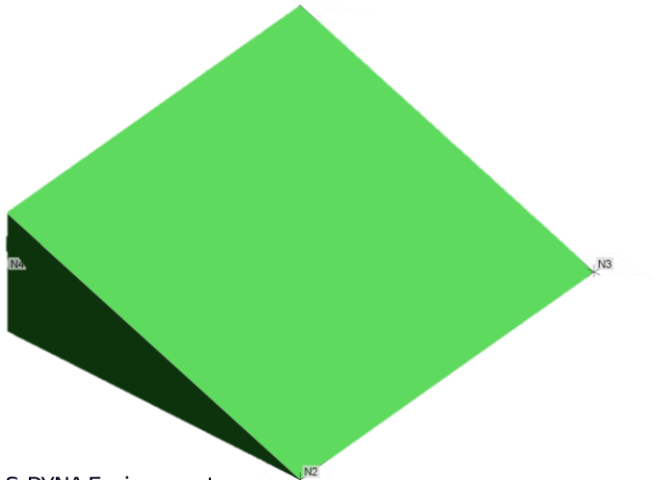
The screenshot shows the 'Forming' tool interface. It has a title bar with a question mark and a close button. Below the title bar are 'Apply' and 'Help' buttons. The interface is divided into two main columns: 'Target' and 'Source'. Each column has a text input field for a model name (e.g., '1 ()' for Target, '2 ()' for Source) and a button to pick nodes ('Pick Target nodes' and 'Pick Source nodes'). Below these are three rows for 'Node 1', 'Node 2', and 'Node 3', each with a text input field containing '0'. On the left side, there is a list of checkboxes: 'Map initial stresses' (checked), 'Map plastic strains' (checked), 'Map initial strains' (unchecked), 'Map thicknesses' (checked), 'Reflect in Y = 0' (unchecked), and 'Interpolate thickness' (checked, highlighted with a red box). On the right side, there is a 'Search distance' section with a question mark button, a radio button for 'Side len x' (selected), a radio button for 'Fixed dist', and two text input fields for '2.0' and '25.0'.

Forming tool – Interpolate shell thickness

Mapping shell thickness from Shell 1 (green)
onto Shell 2 (red) using the forming tool:



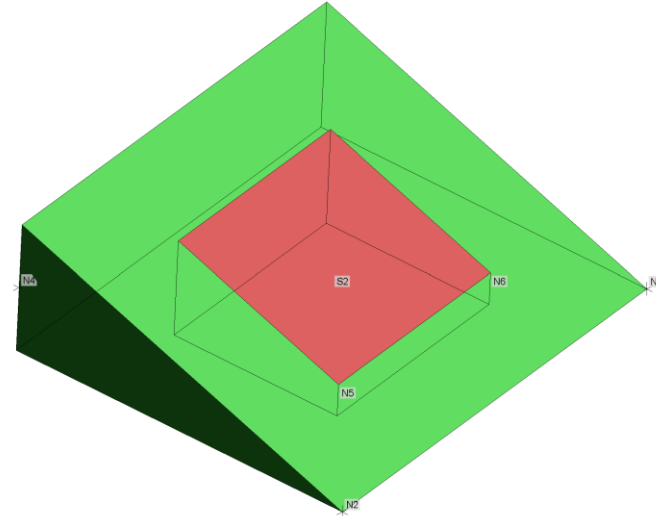
Shell 1 has thickness 0 at nodes N2, N3 and
thickness 4 at nodes N4, N5:



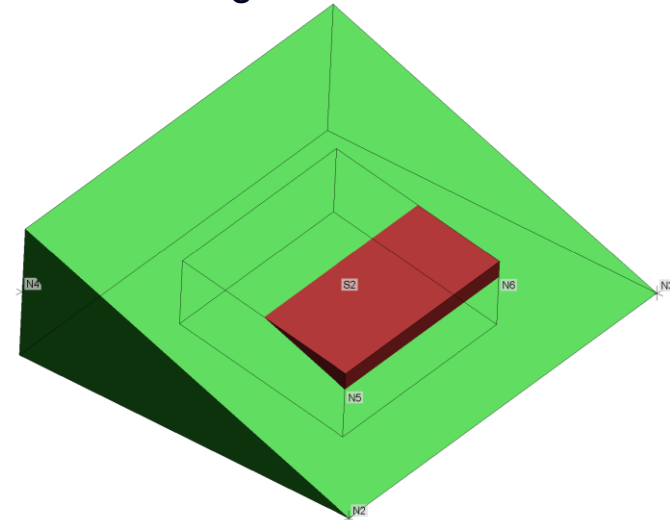
Mapping shell
thickness



Using new thickness interpolation:



Using old method:



Preferences

New preferences

Preference	Description
<code>oasys*javascript_maximum_memory_size</code>	Maximum memory allocated for garbage collection (MB)
<code>oasys*cd_compose_email</code> <code>primer*cd_compose_email</code>	Whether or not to offer to compose an email for sending minidump files.
<code>oasys*cd_email_address</code> <code>primer*cd_email_address</code>	Email address in To: field of crash dump emails.
<code>oasys*cd_cc_addresses</code> <code>primer*cd_cc_addresses</code>	Email address(es) in Cc: field of crash dump emails.
<code>oasys*cd_custom_email</code> <code>primer*cd_custom_email</code>	Custom method of sending emails.
<code>oasys*cd_dump_directory</code> <code>primer*cd_dump_directory</code>	Directory in which to save crash dump files
<code>oasys*cd_email_method</code> <code>primer*cd_email_method</code>	Method used to create crash dump emails.
<code>oasys*cd_minidump_file</code> <code>primer*cd_minidump_file</code>	Whether or not to create minidump files, and what to do with them.

New preferences

Preference	Description
<code>primer*battery_undo_warn</code>	Warn before deleting entities from following steps
<code>primer*battery_overwrite_analysis_warn</code>	Warn before overwriting control keywords in 'Analysis' panel
<code>primer*check_tree_category_list</code>	List of user categories to be displayed on check tree e.g. LOW_PRIORITY:HIGH_PRIORITY:FATAL
<code>primer*default_table_create</code>	Default option for table create edit panel.
<code>primer*database_des_check</code>	Check for absence of database history des
<code>primer*max_contact_parmax_for_arcweld</code>	Max parmax used when creating arc-weld contact (1.01,1.02...)
<code>primer*modular_bolts_get_unique_deformable_parts</code>	Multiple modular bolts will share same deformable part unless this is set
<code>primer*modular_bolts_form_set_gen_add_contact</code>	Multiple modular bolts containing SET_GENERAL will form SET_ADD and *CONTACT
<code>primer*spotweld_remake_auto_remove_layer</code>	TRUE to automatically remove layer(s) that failed to connect when remaking spotwelds

New preferences

Preference	Description
<code>primer*contact_post_redist_perc</code>	Percentage of unused memory to distribute to free pool after contact checking
<code>primer*contact_post_redist_type</code>	Which memory types to redistribute after contact checking
<code>primer*contact_treat_attached_node_as_tied</code>	Include attached nodes in tied contact in the tied count
<code>primer*cut_section_neg_action</code>	Negative action for cut sections
<code>primer*cut_section_pos_action</code>	Positive action for cut sections
<code>primer*hbm_use_new_cable_node_panel</code>	The new cable nodes attachment panel will be activated by default while working with human body models
<code>primer*hbm_treat_bones_as_rigid</code>	PRIMER rigidifies all Bone related parts in a human body model for Ansys LS-DYNA positioning analysis
<code>primer*dummy_hbm_use_new_cable_equation</code>	Use the new equation to create the *DEFINE_CURVE used while pulling positioning cables for Dummies/HBMs during Ansys LS-DYNA analysis

New preferences

Preference	Description
<code>primer*hbm_use_encrypted_mats_for_cables</code>	PRIMER will use the encrypted materials for finding cable attachment nodes
<code>primer*forming_shell_thickness_interpolation</code>	Forming to interpolate shell thickness rather than averaging it
<code>primer*missing_include_file_action</code>	Whether or not to remember missing (skipped on input) include file definitions
<code>primer*threaded_elem_node_lookup_spin</code>	Number of spin iterations in threaded element topology lookup before sleep
<code>primer*load_path_intersection_warning</code>	Warn about unexpected intersections when auto-creating a load path
<code>primer*load_path_exclude_solids</code>	Exclude solid elements by default when auto-creating a load path
<code>primer*load_path_exclude_beams</code>	Exclude beam elements by default when auto-creating a load path

New preferences

Preference	Description
<code>primer*load_path_exclude_shells</code>	Exclude shell elements by default when auto-creating a load path
<code>primer*load_path_exclude_tshells</code>	Exclude thick shell elements by default when auto-creating a load path
<code>primer*load_path_psid_mode</code>	Default mode for Xsec PSID definition
<code>primer*load_path_orientation_mode</code>	Default xsec orientation mode
<code>primer*load_path_position_mode</code>	Default xsec position mode
<code>primer*load_path_pitch</code>	Default pitch value
<code>primer*load_path_xsec_count</code>	Default number of xsecs
<code>primer*load_path_snap_axis</code>	Default 'snap to grid' global axis
<code>primer*load_path_snap_grid</code>	Default 'snap to grid' grid size
<code>primer*load_path_offset</code>	Default start offset
<code>primer*load_path_size_mode</code>	Default xsec size mode
<code>primer*load_path_auto_size_perc_increase</code>	Default percentage increase for the auto-size mode

New preferences

Preference	Description
<code>primer*load_path_auto_size_only_vis</code>	Default 'only visible' status for the auto-size mode
<code>primer*load_path_auto_size_max</code>	Default max size for the auto-size mode
<code>primer*load_path_l_length</code>	Default L length for the fixed-size mode
<code>primer*load_path_m_length</code>	Default M length for the fixed-size mode
<code>primer*load_path_add_loc_to_title</code>	Default status of the 'Automatically add location to title'
<code>primer*orient_child_include_with_parent</code>	Orient child include(s) when parent is oriented
<code>primer*excel_drawing_mode</code>	Type of Images in excel output for keywords
<code>primer*excel_find_volume</code>	Find volume for database history node images in excel output for keywords
<code>primer*excel_image_column</code>	Column in which images are written in excel
<code>primer*excel_image_height</code>	Height of Images(pixels) in excel output for keywords
<code>primer*excel_image_orientation</code>	View of Images in excel output for keywords
<code>primer*excel_image_width</code>	Width of Images(pixels) in excel output for keywords

New preferences

Preference	Description
<code>primer*excel_recursive_loops</code>	No of recursive loops in find attached for database history beam images in excel output
<code>primer*define_transformation_transl2nd_a3_zero</code>	Behaviour for *DEFINE_TRANSFORMATION TRANSL2ND option with a3 zero
<code>primer*output_control_solid_tet13v_r11</code>	Output field TET13V on *CONTROL_SOLID in R11
<code>primer*belt_ignore_pelvis_rotation_check</code>	Show the pelvis buckle rotation warning about lap belt point type.
<code>primer*gtune_vbo_mult</code>	The number of GDSIZE cache blocks in a VBO
<code>primer*gtune_gdsize</code>	Size of graphics data cache storage in KWords

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