PRIMER 22.1

Oasys
LS-DYNA Environment

PRIMER 22.1 – Contents

Oasys ❖ LS-DYNA Environment

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).
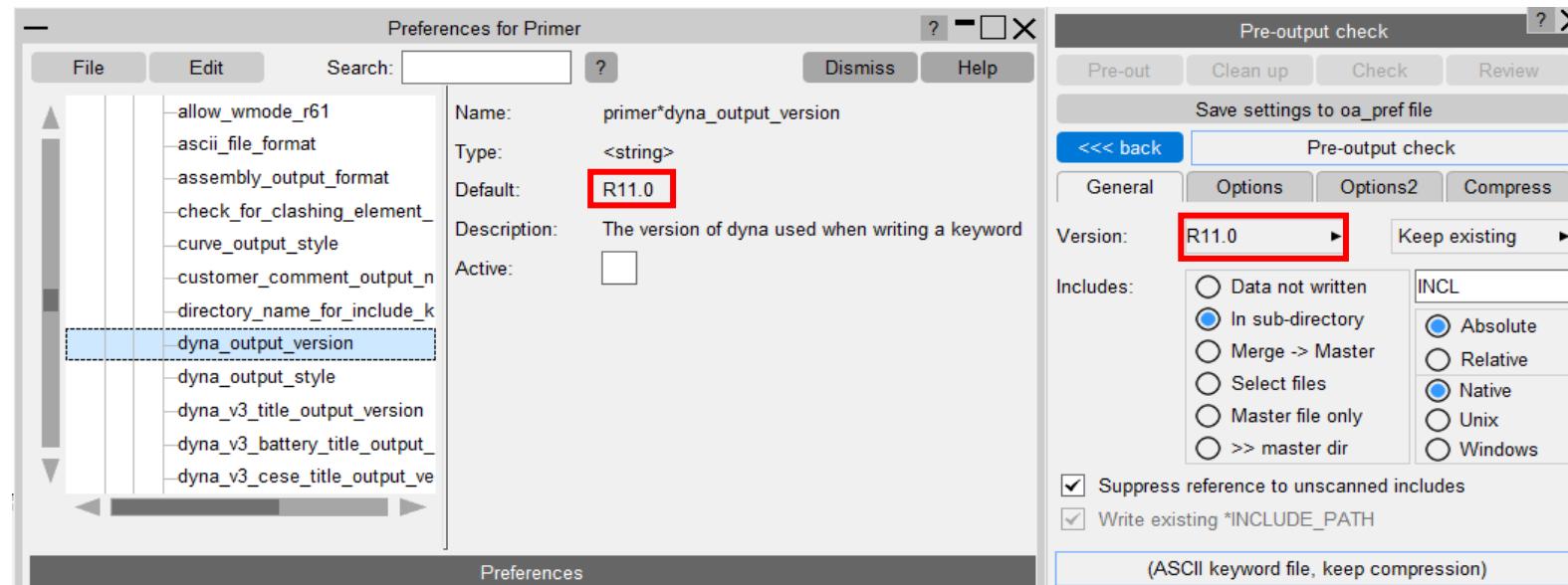
Support for *AIRBAG_CPG

A New Airbag Gas Solver
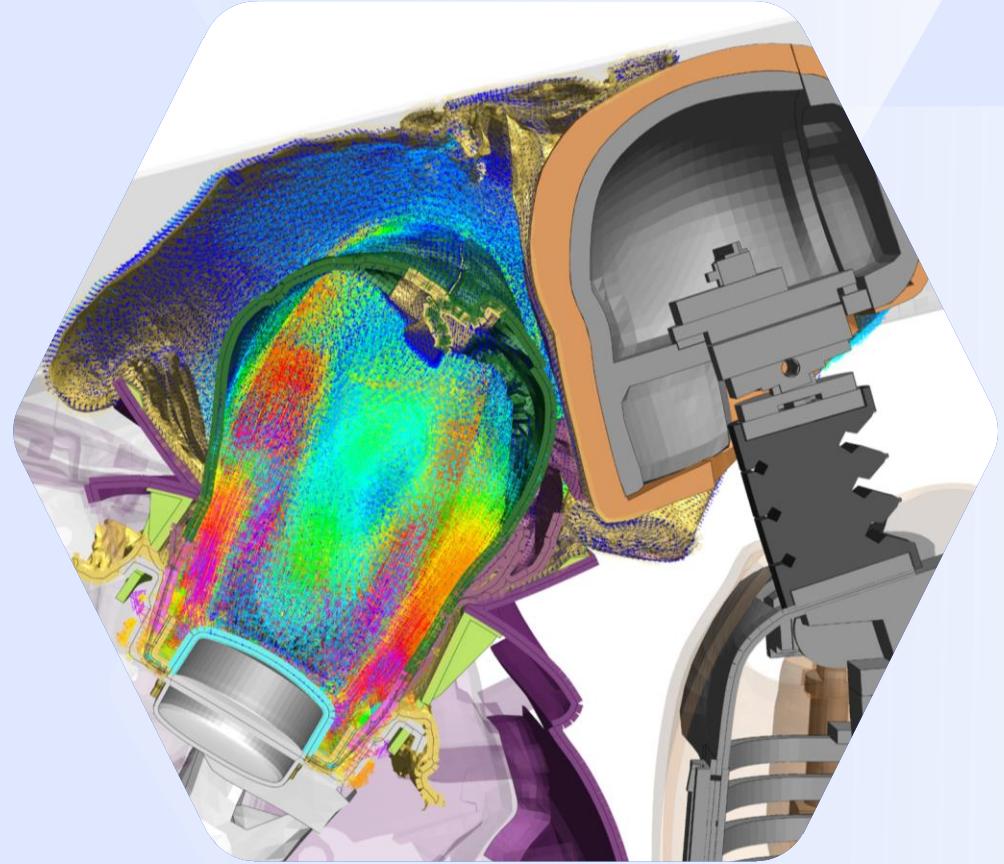
Support for Continuum-based Particle Gas (CPG)

- 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.

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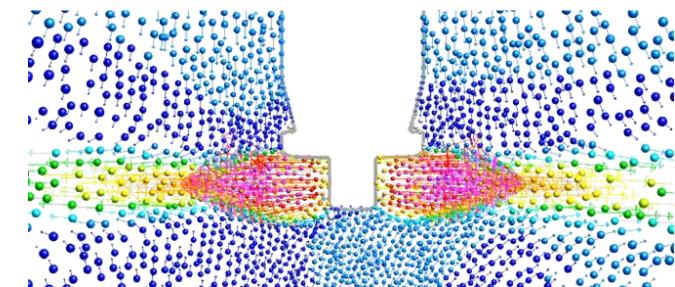
Support for CPG Keyword Input in PRIMER

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**

Images courtesy of JSOL Corporation

Oasys LS-DYNA Environment

Improvements to Include File Handling

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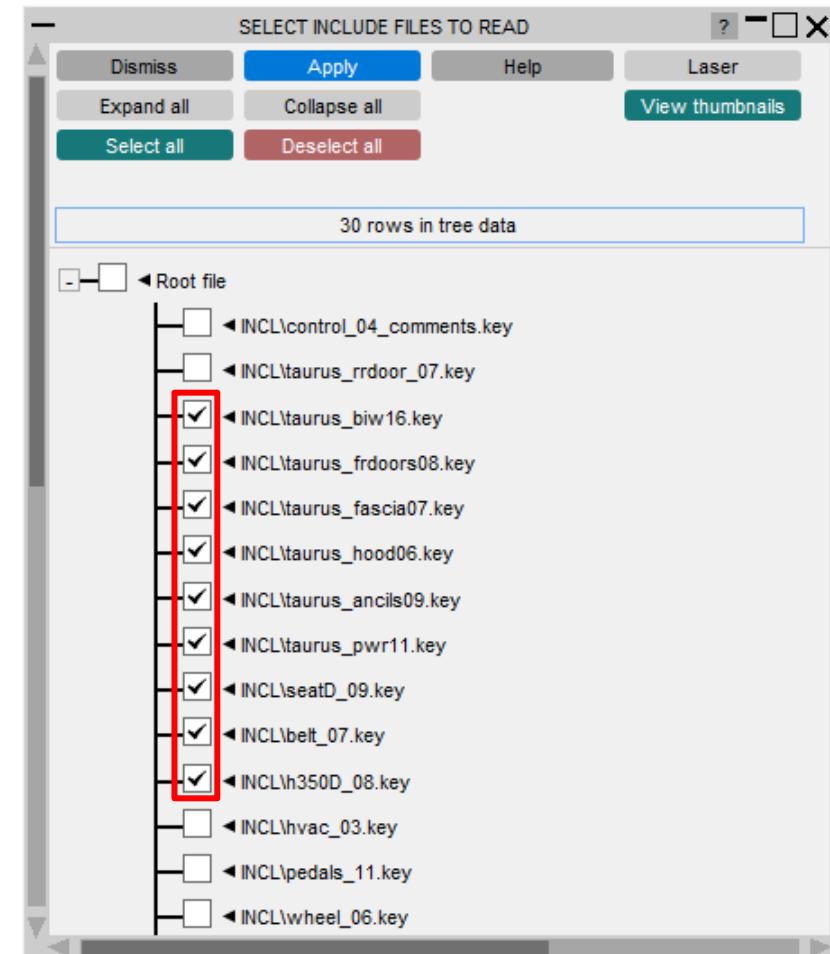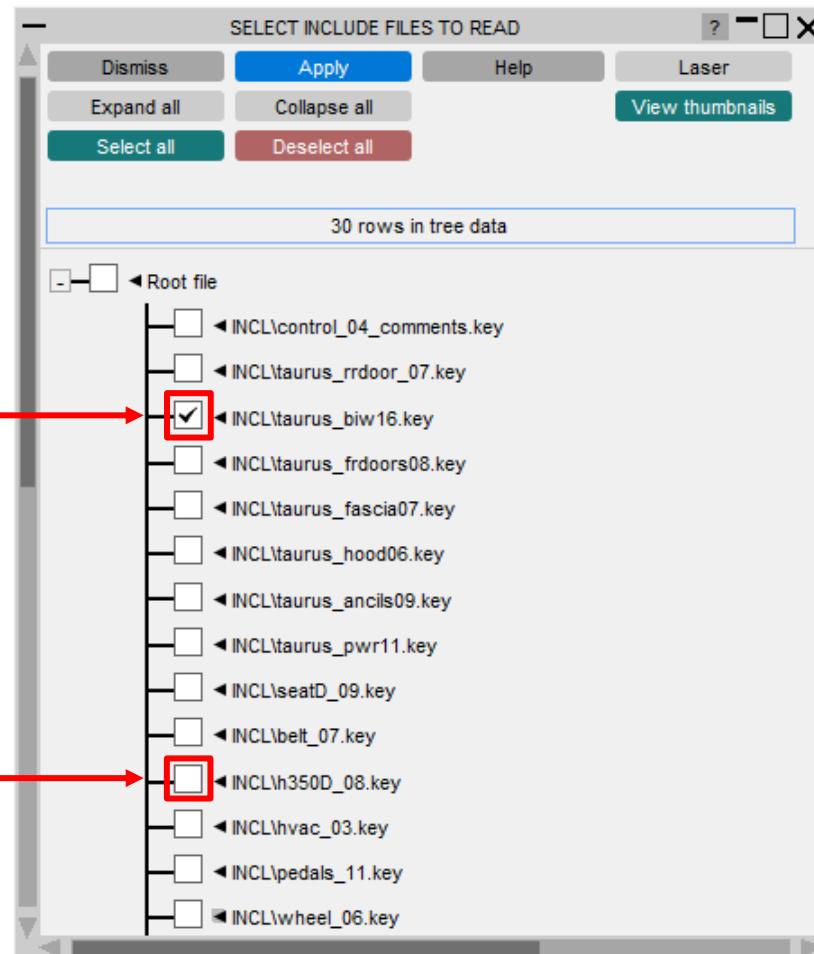
All include files between clicks are (de)selected. Supported for reading and writing include files

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.
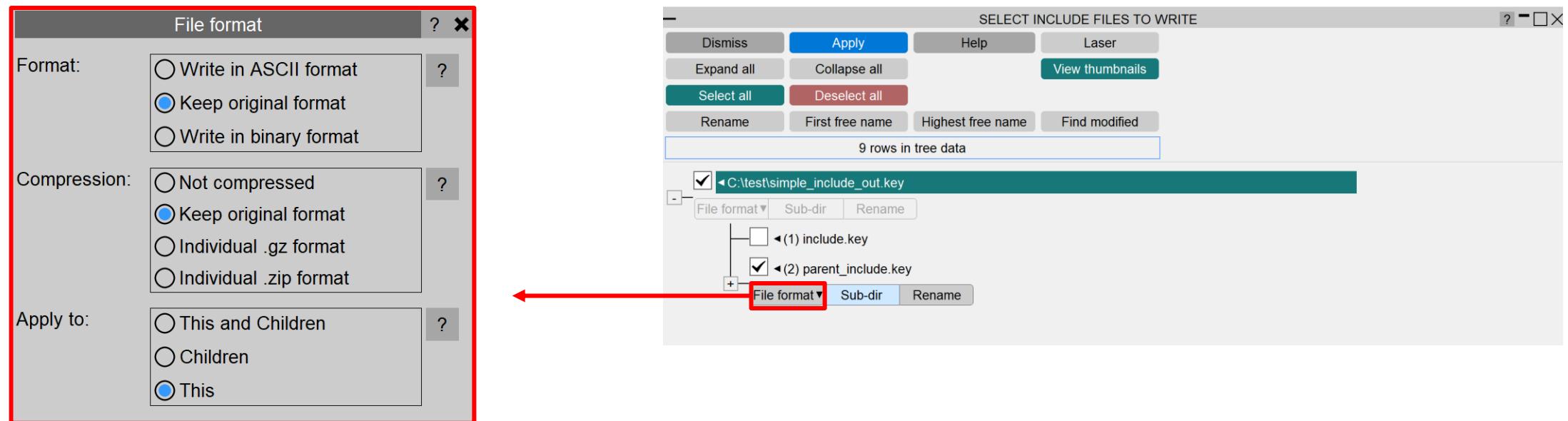
*TITLE and Includes

- 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

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13

# Keyword Output to Excel

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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.
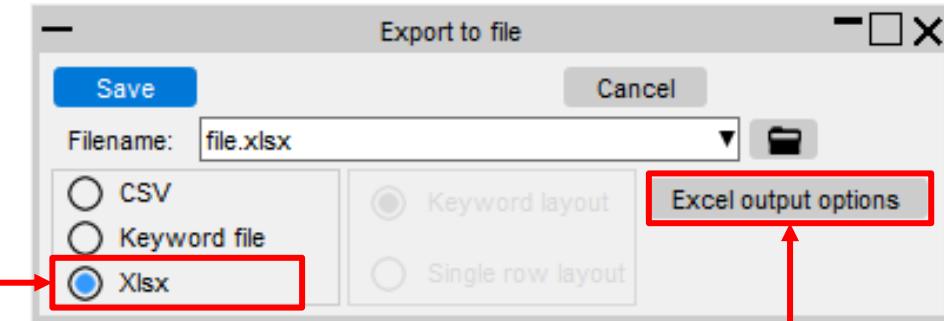
- This export to Xlsx functionality is available for all keywords.

- 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.

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Excel output options for Images
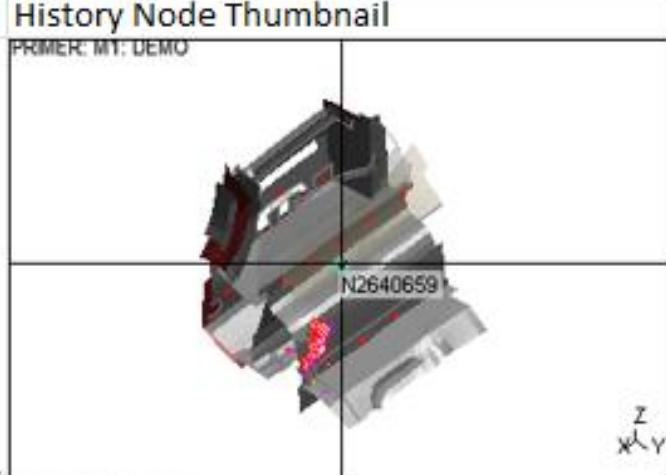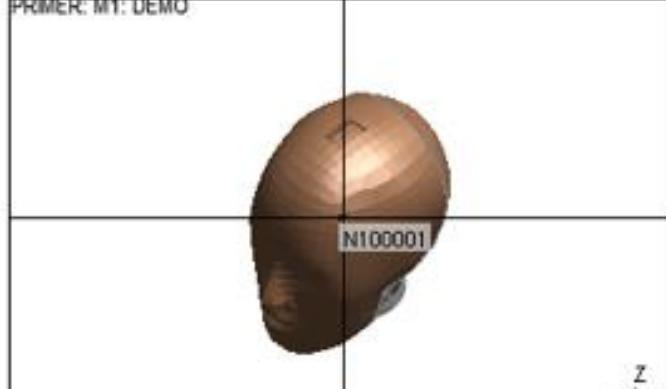
- Images can currently be captured for the following keywords:
  - ***DATABASE_HISTORY_NODE**
  - ***DATABASE_HISTORY_BEAM**
  - ***DATABASE_CROSS_SECTION**

- 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**.

Excel output options

Save to oa_pref	Reset all	Help

Find Volume:	200.0
Orientation View:	+ISO ▶
Drawing Mode:	SH ▶
Recursive loops for find attached:	3.0
Image Width(in pixels) :	257.0
Image Height(in pixels) :	166.0
Image column:	LAST ▶

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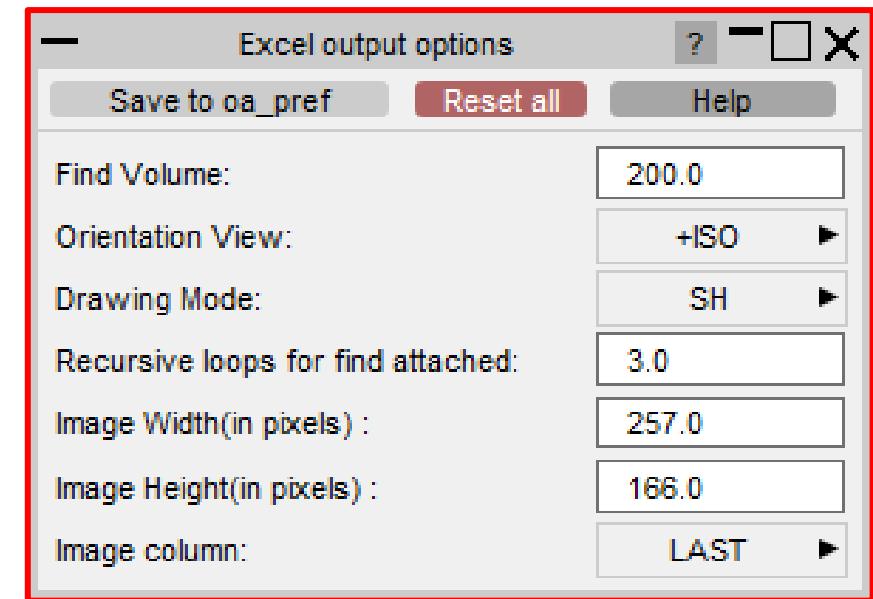
Writing Keyword Definitions and Images in Excel Format
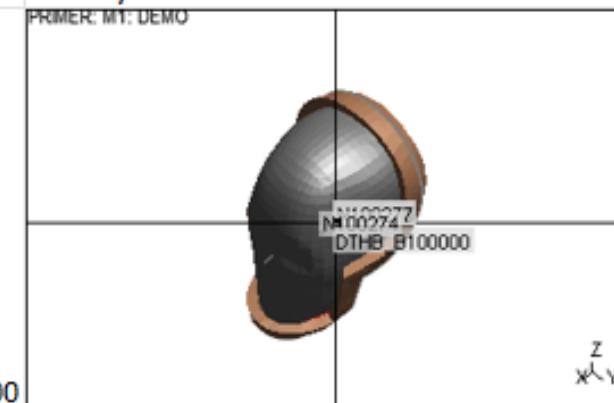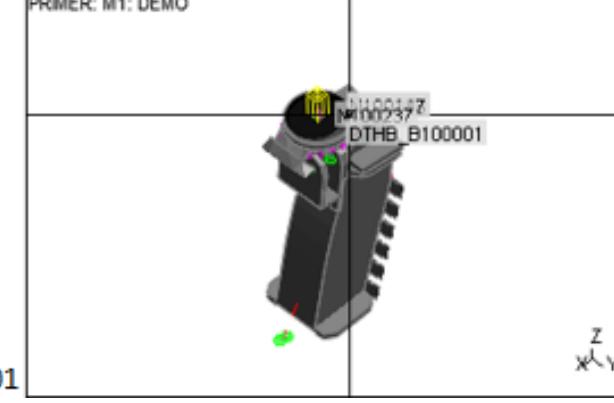
- ***DATABASE_HISTORY_NODE:**
  - Image based on items found within a cube volume centred on the node.
  - The input value (Find Volume) defines the cube volume for the search.

Writing Keyword Definitions and Images in Excel Format

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

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.
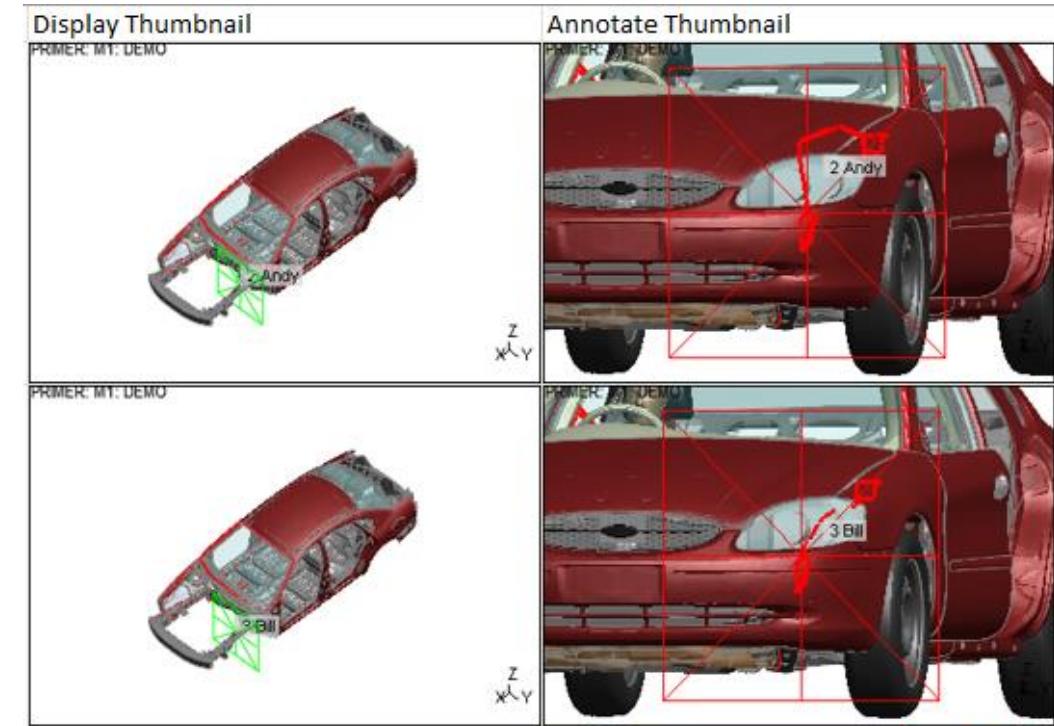
User Defined Error Categories

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.
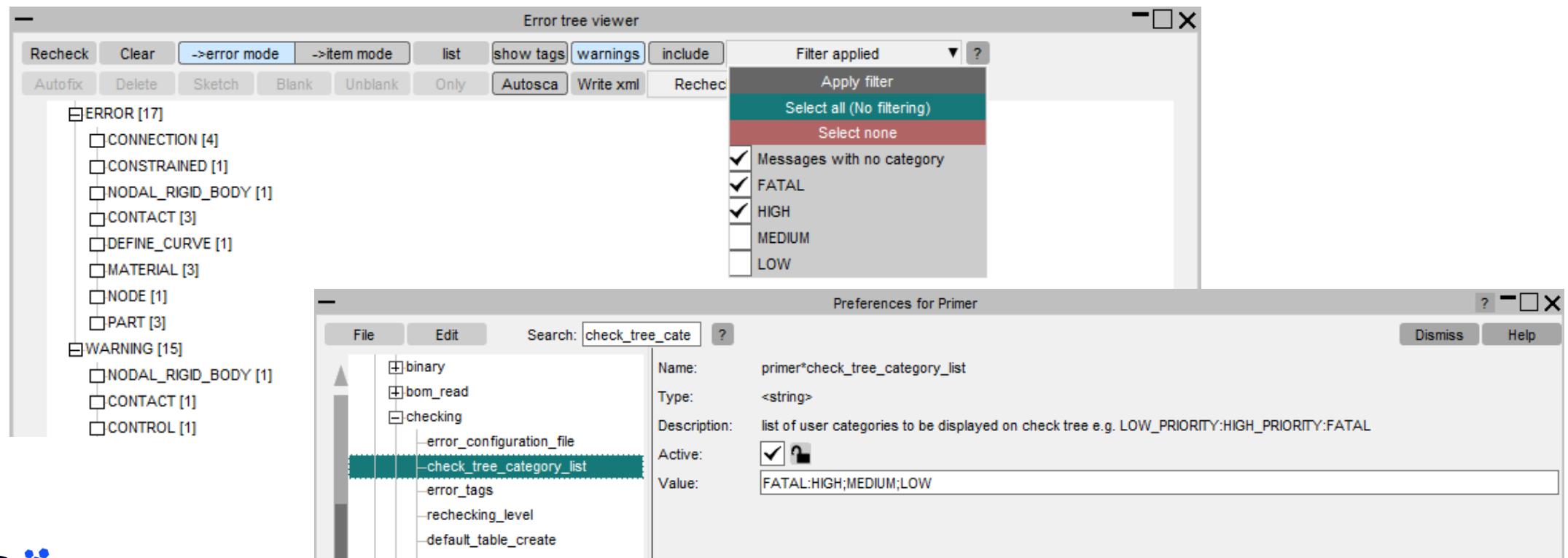
Filtering of errors and warnings by category

- 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.
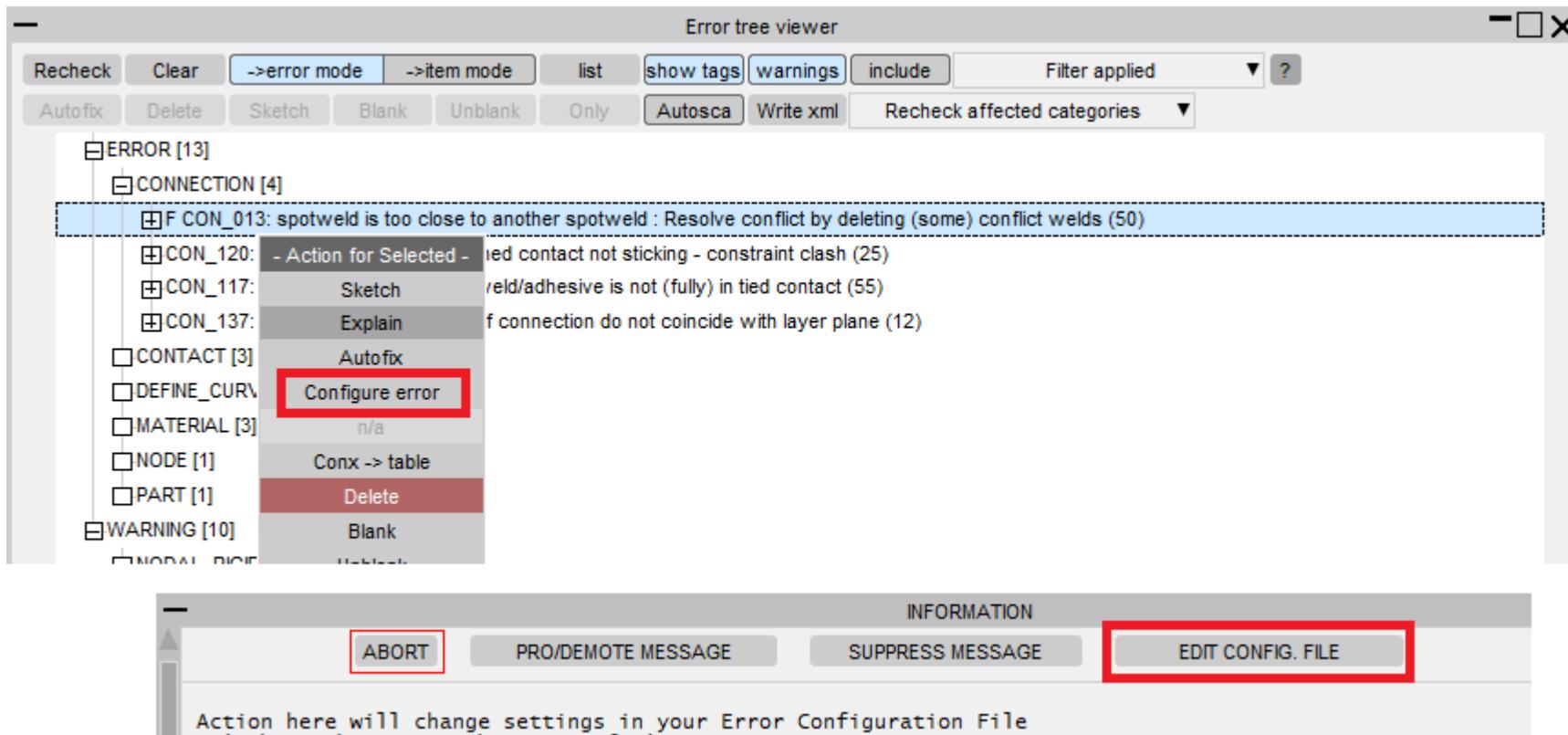
Battery Setup Tool Enhancements

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.
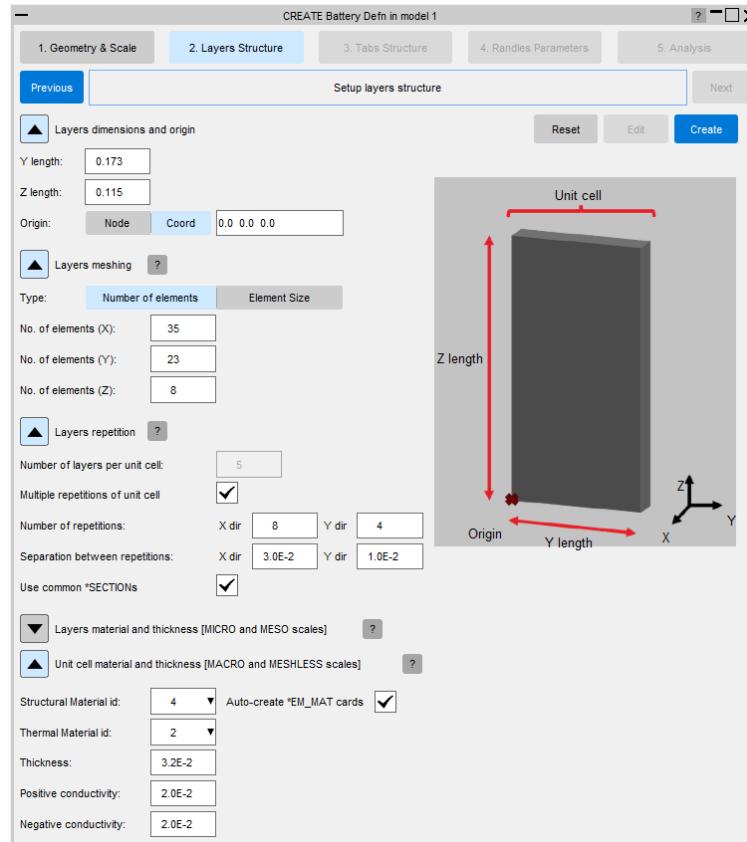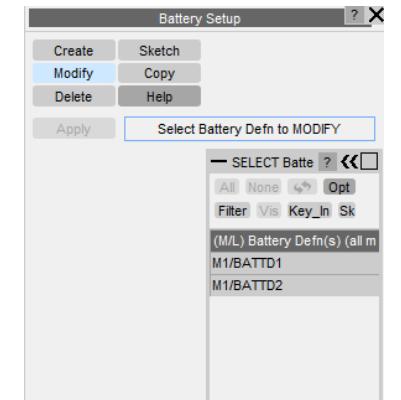
Initial orientation of the battery cell

- 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.
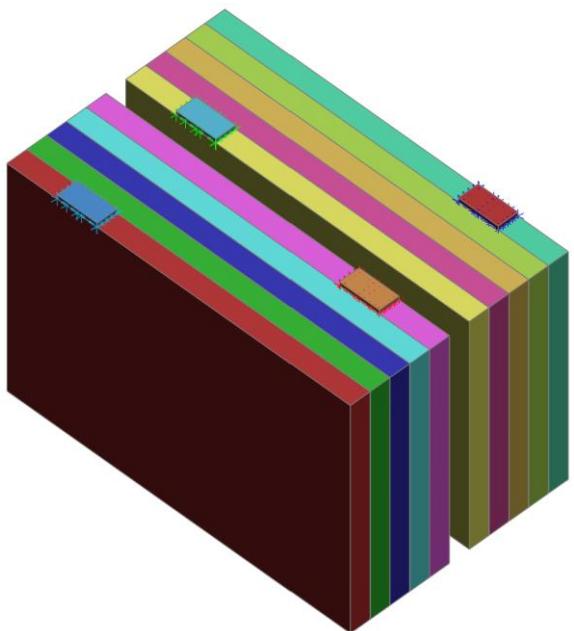
New orientation
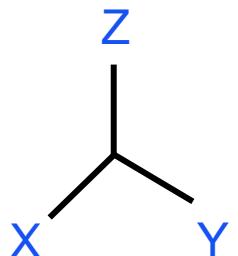
Old orientation
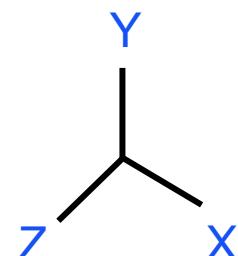
Creation of *EM_MAT

- 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.

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.
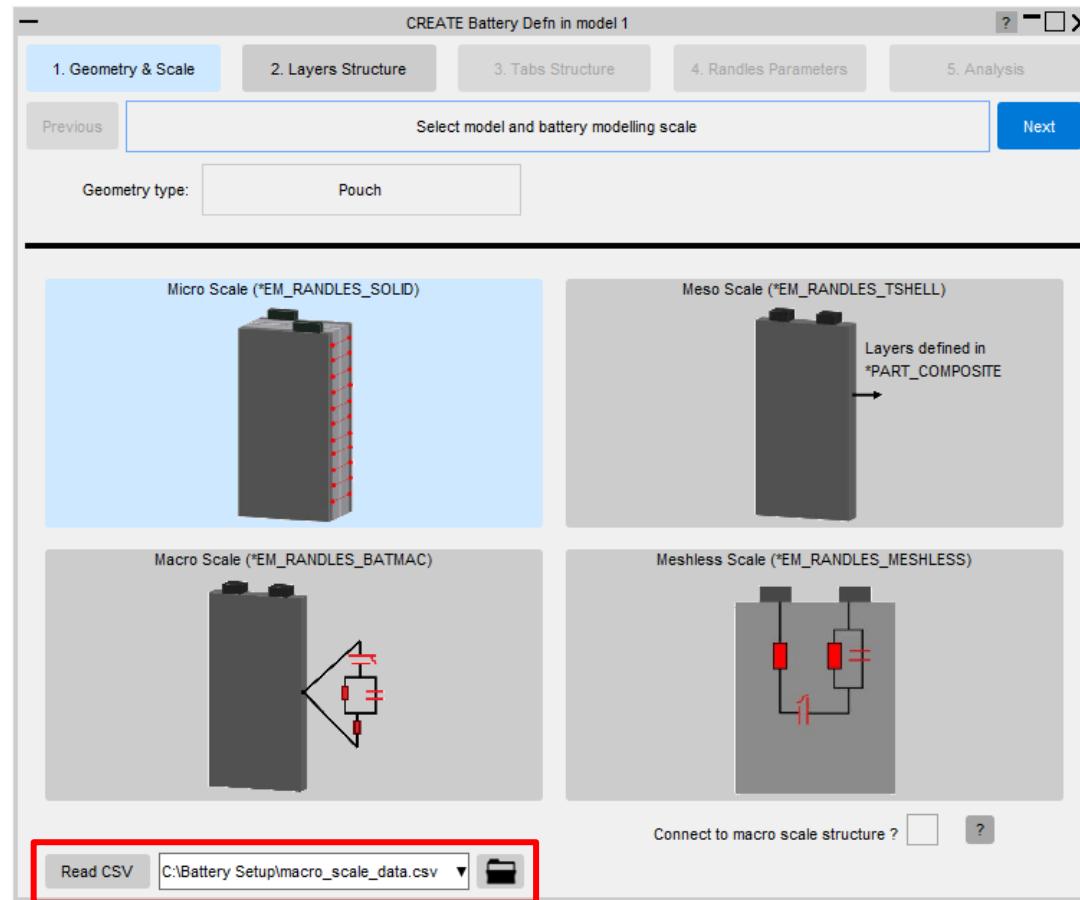
*EM_ISOPOTENTIAL and *EM_ISOPOTENTIAL_CONNECT

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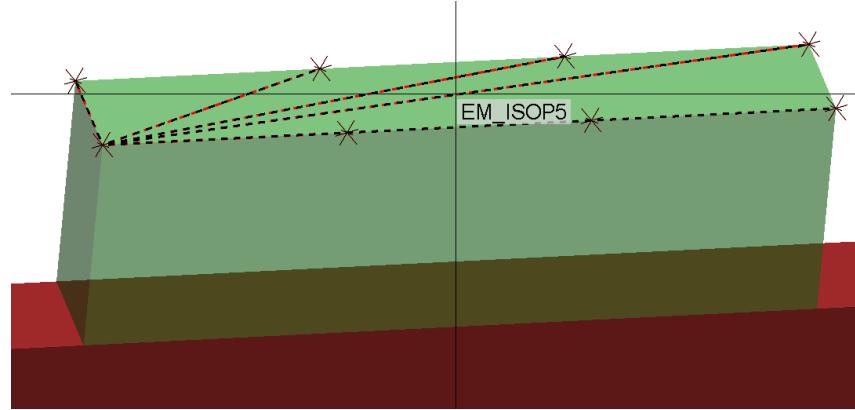

- Added drawing, sketching and picking functionalities for ***EM_ISOPOTENTIAL_CONNECT**.
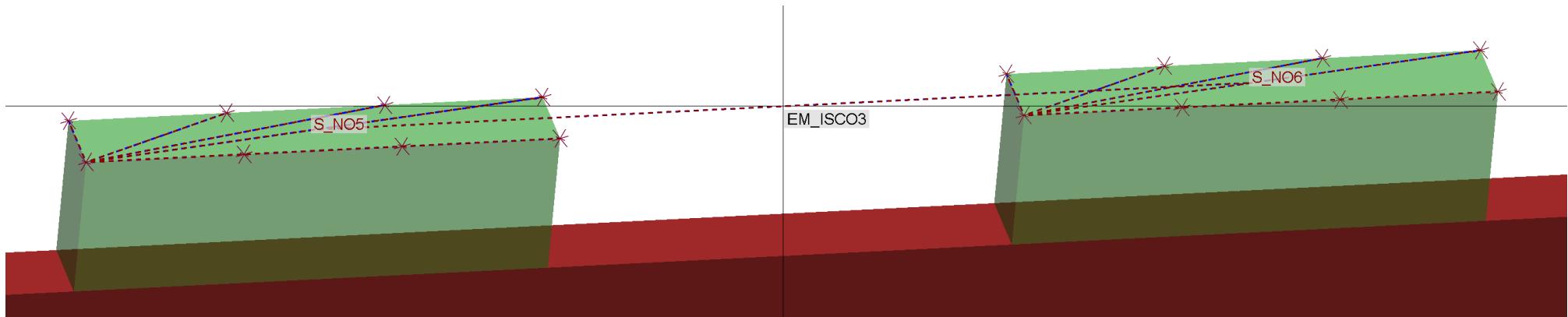
*EM_ISOPOTENTIAL and *EM_ISOPOTENTIAL_CONNECT

- 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.
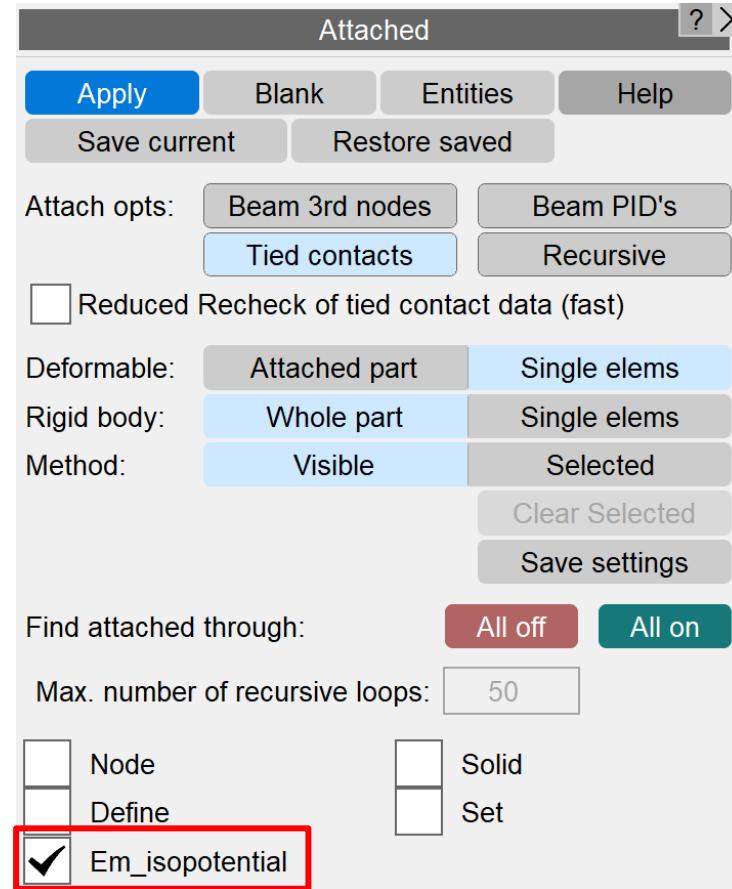
Ability to go back to previous steps and edit

- 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.
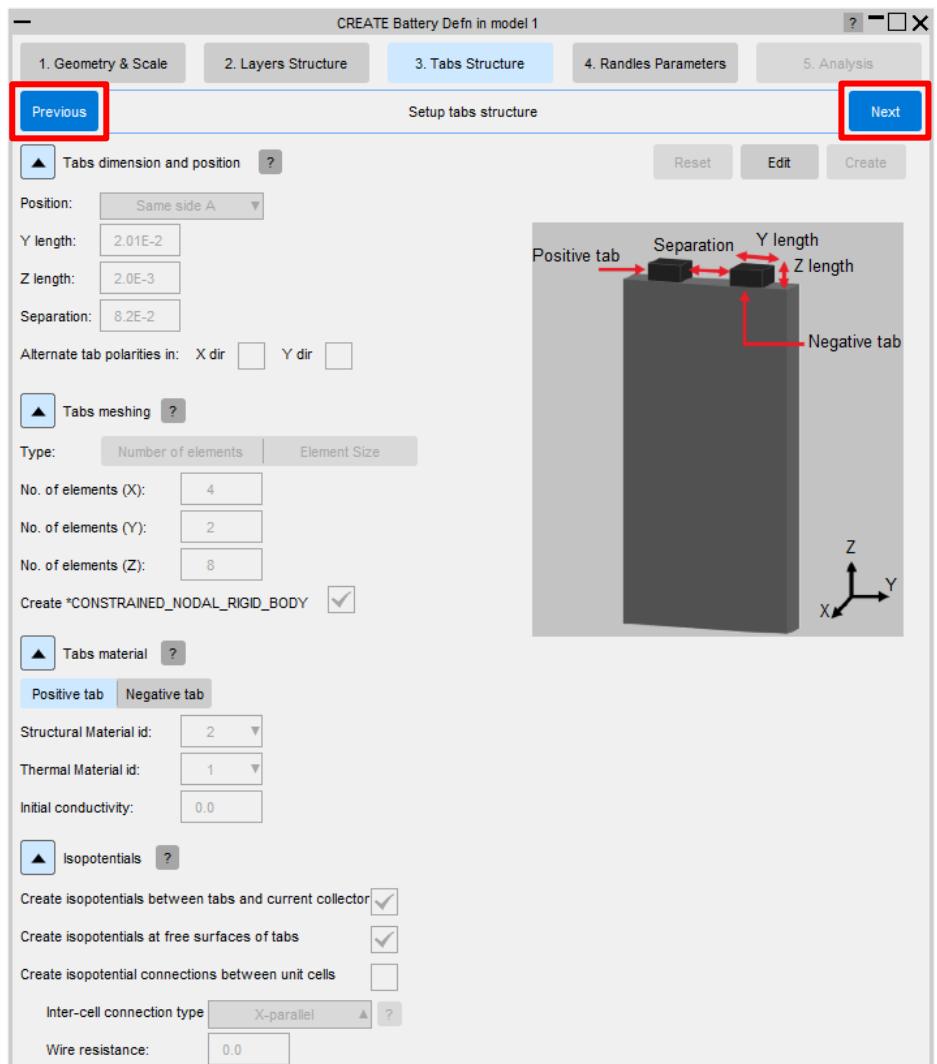
Ability to go back to previous steps and edit

- Added the option to undo creation of 'Layers structure', 'Tabs structure' and 'Randles parameters' using the **Edit** button.
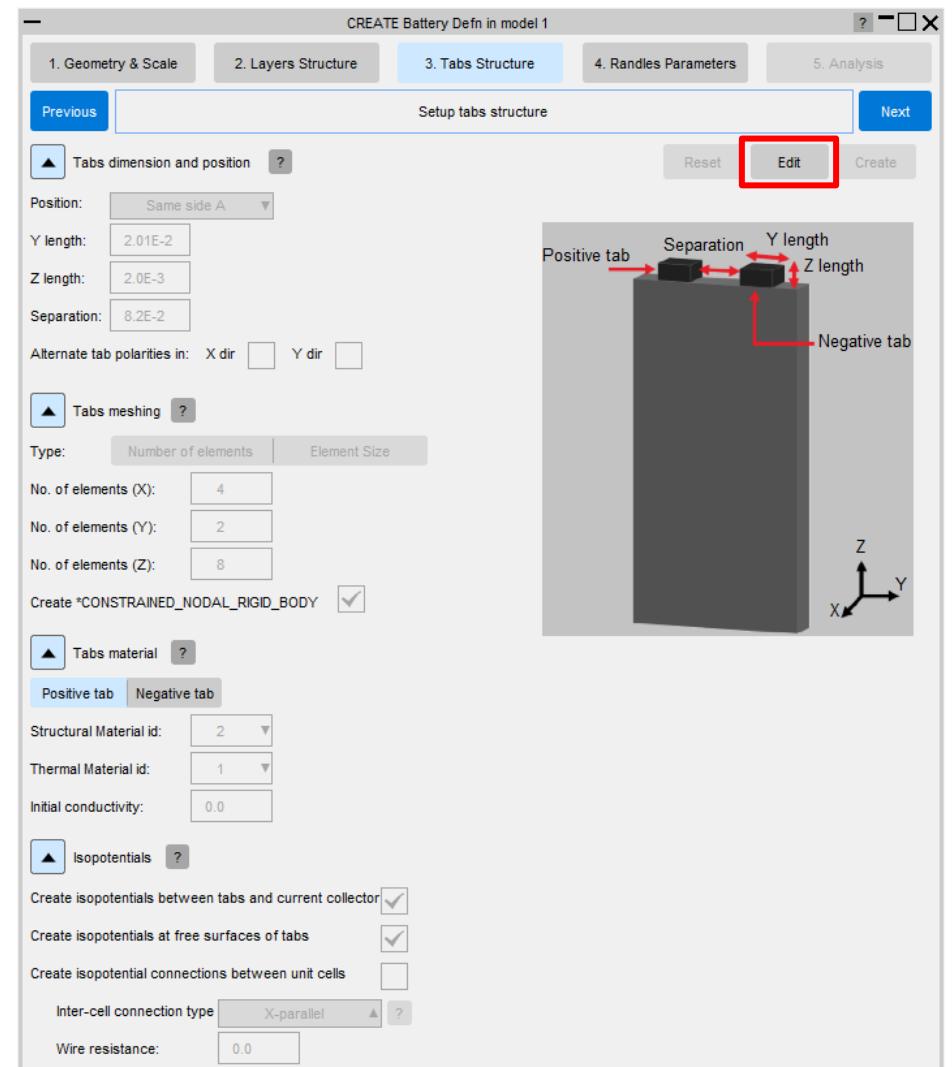
Ability to go back to previous steps and edit

- 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.
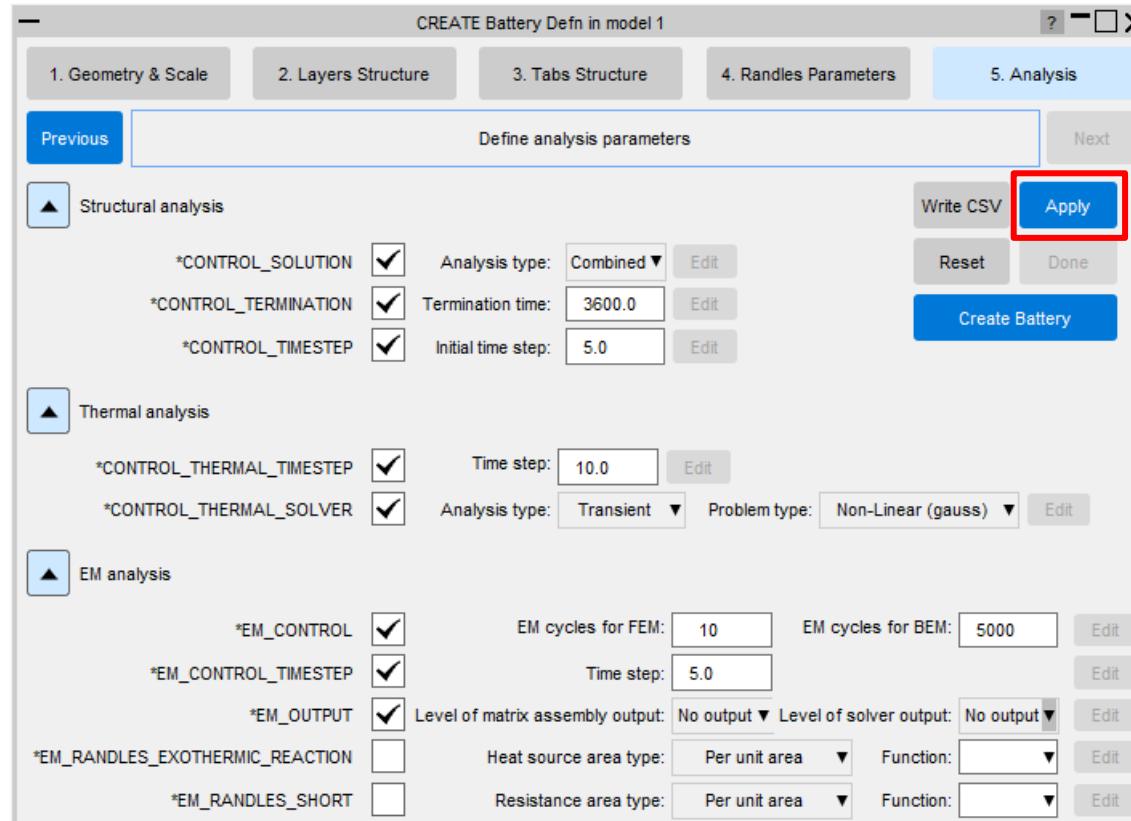
Ability to go back to previous steps and edit

- Added the option to reset all the parameters to their defaults at any stage.
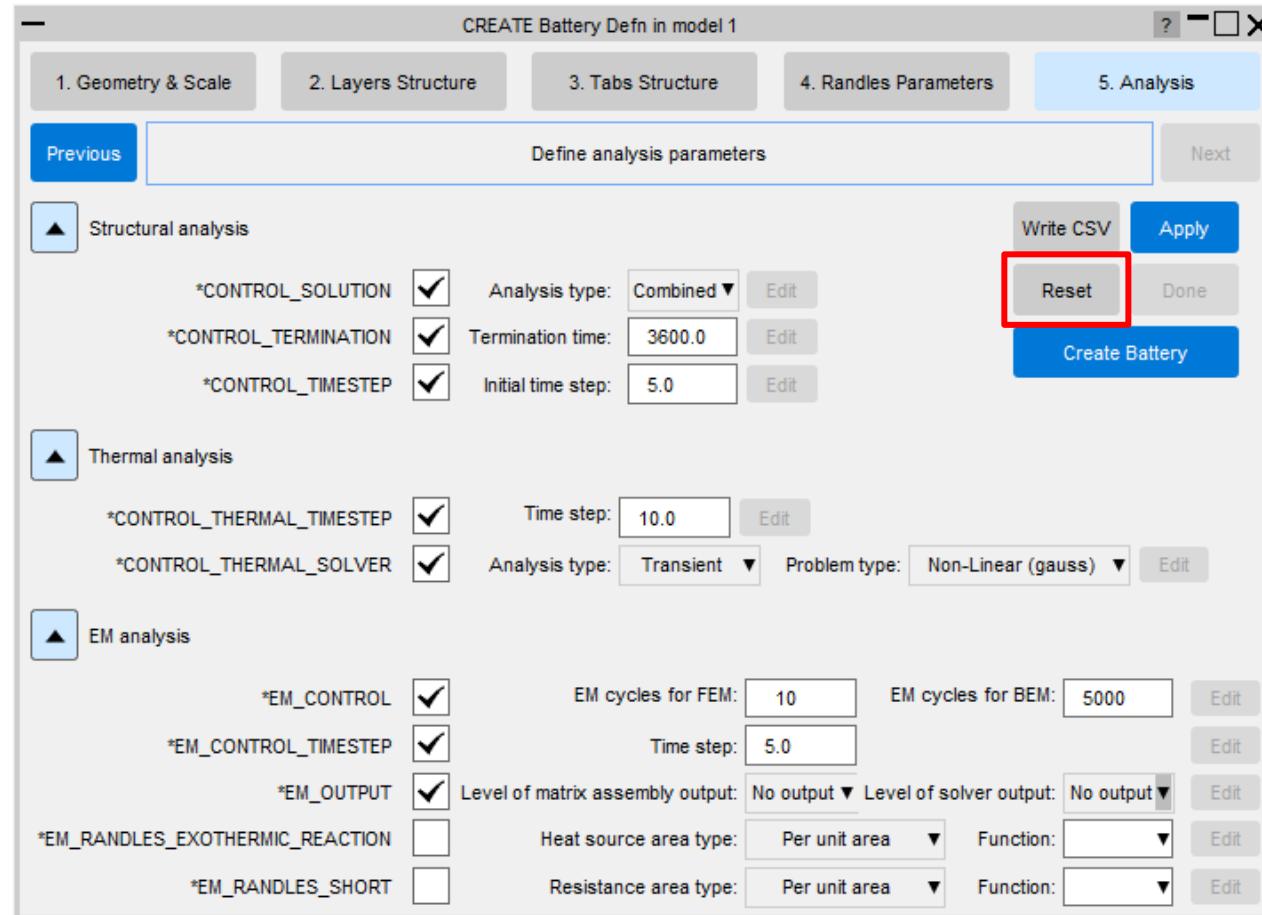
Creating an array of unit cells

- 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.
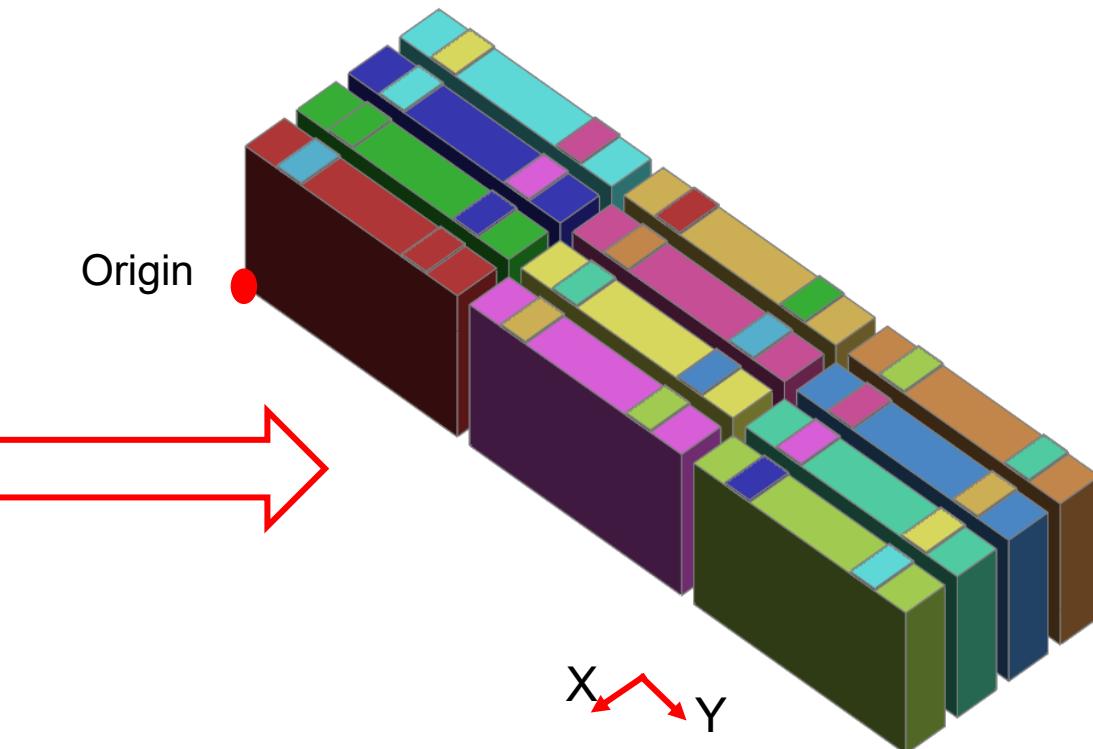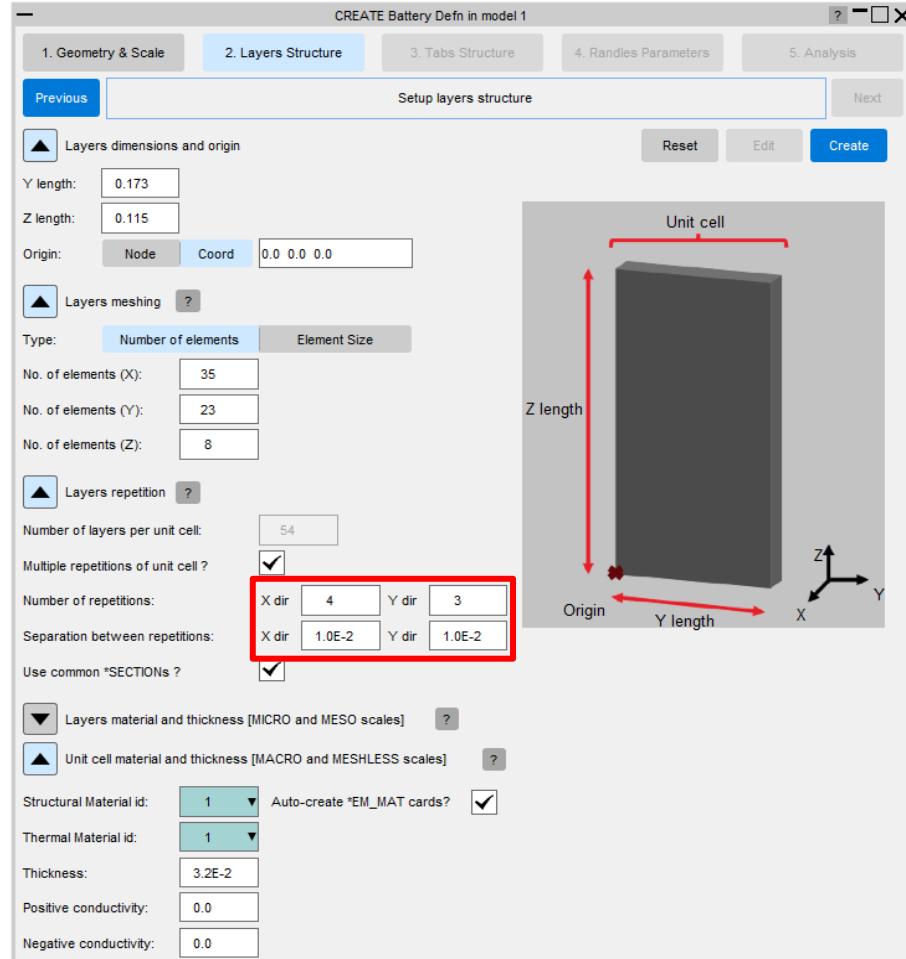
Alternating tab polarities

- 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.
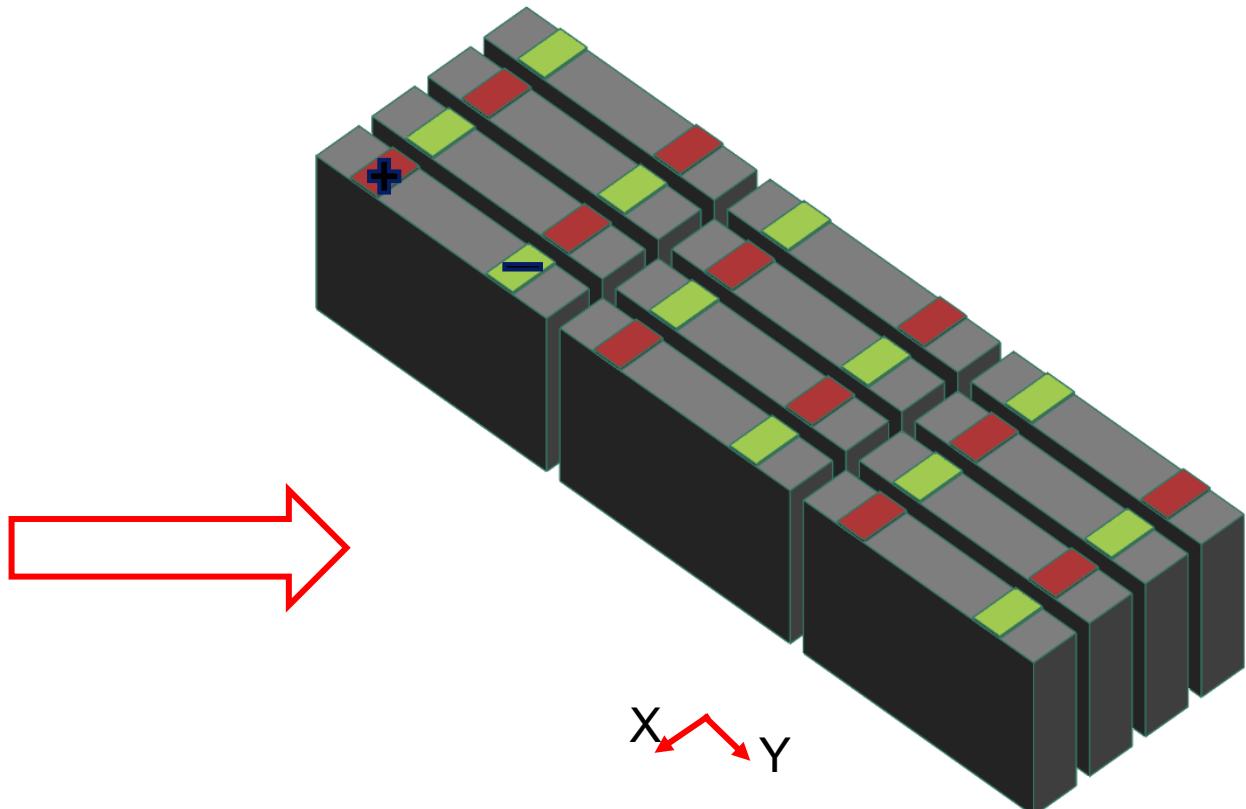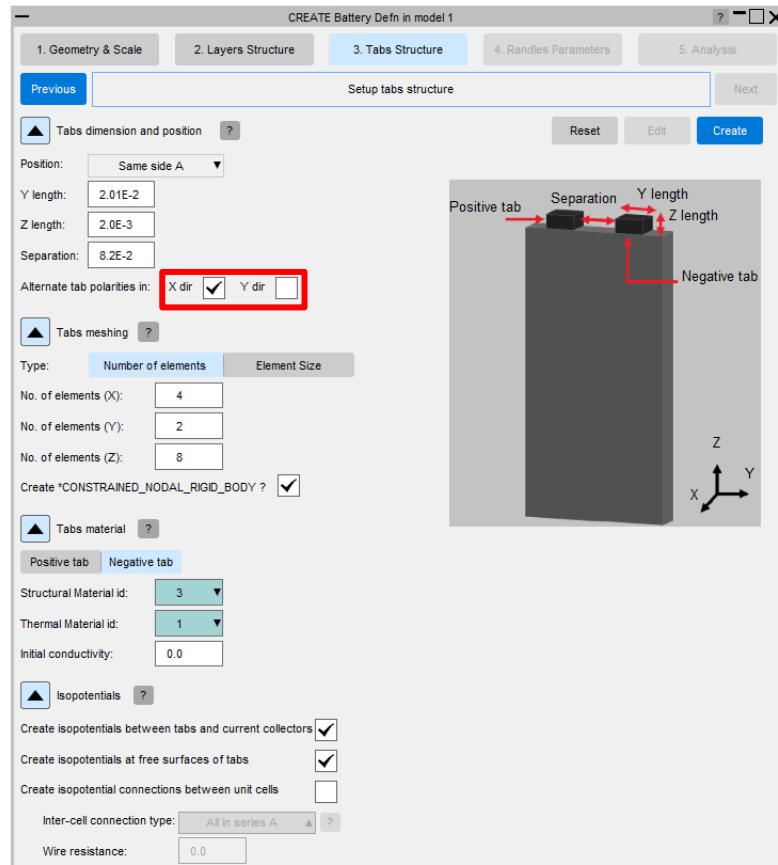
Isopotential connections between unit cells

- 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.
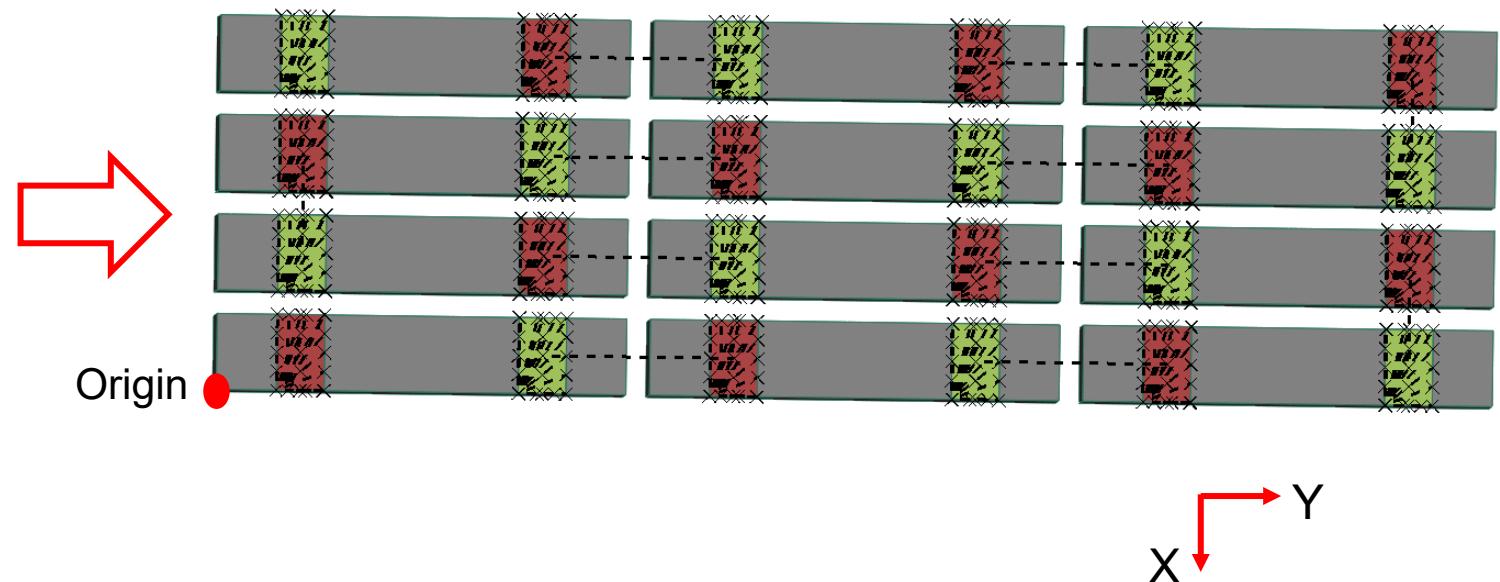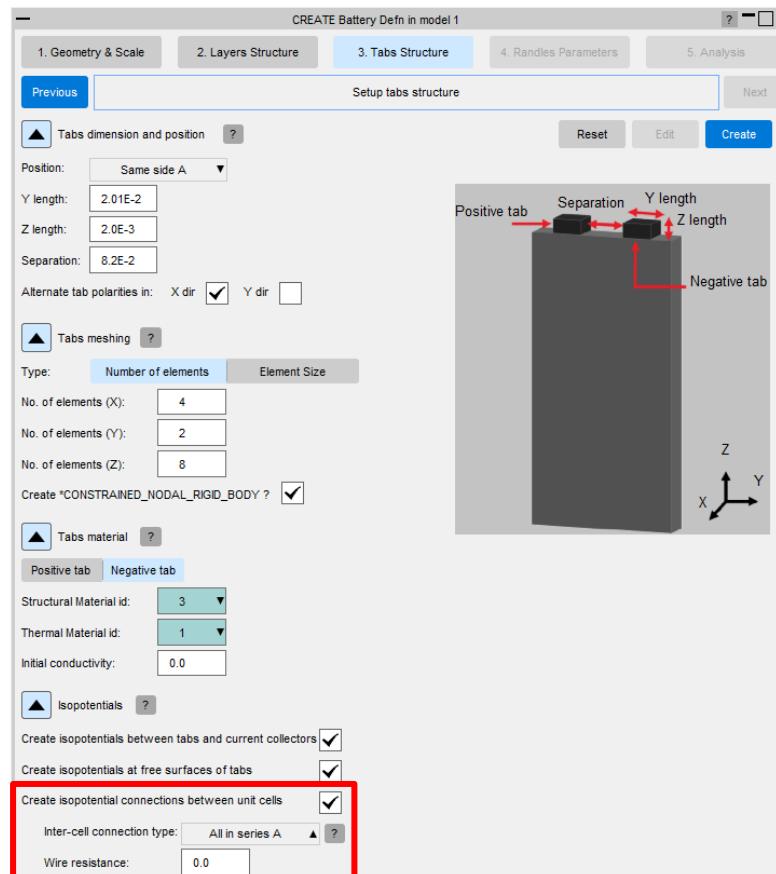
Efficient End-to-End Workflows

Oasys LS-DYNA Environment

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](#)

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C-NCAP Management Regulation
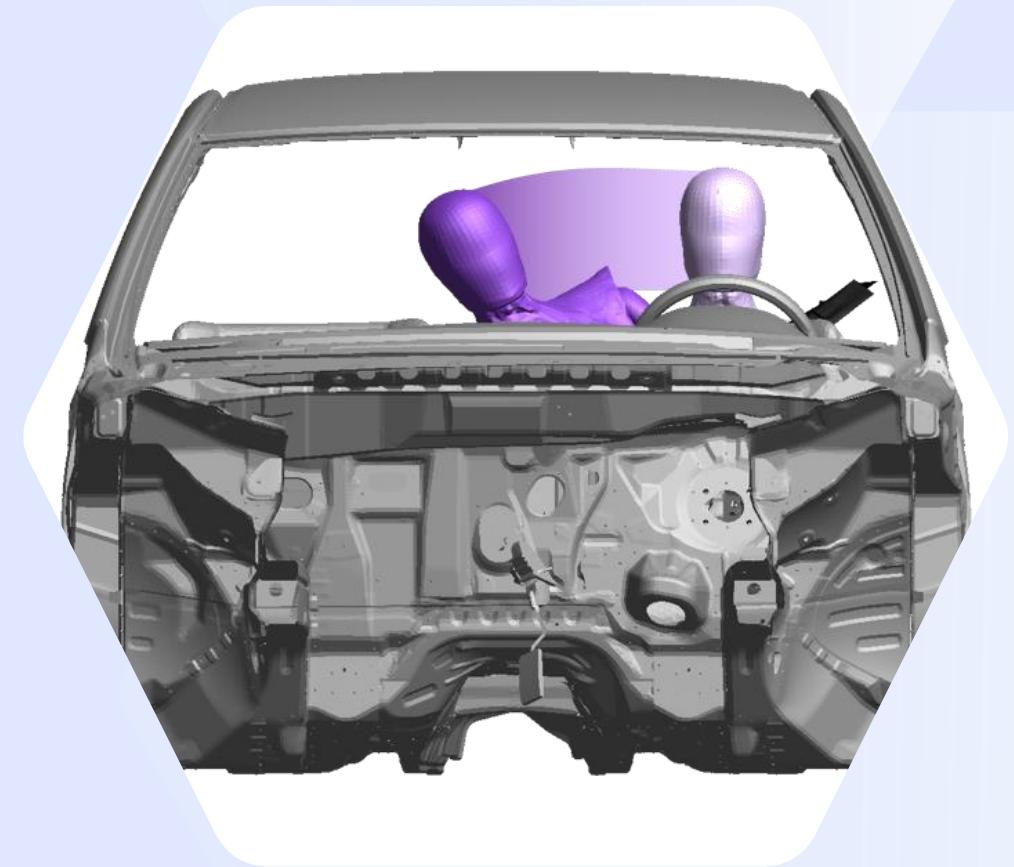
C-NCAP Management Regulation (2024 Edition)

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
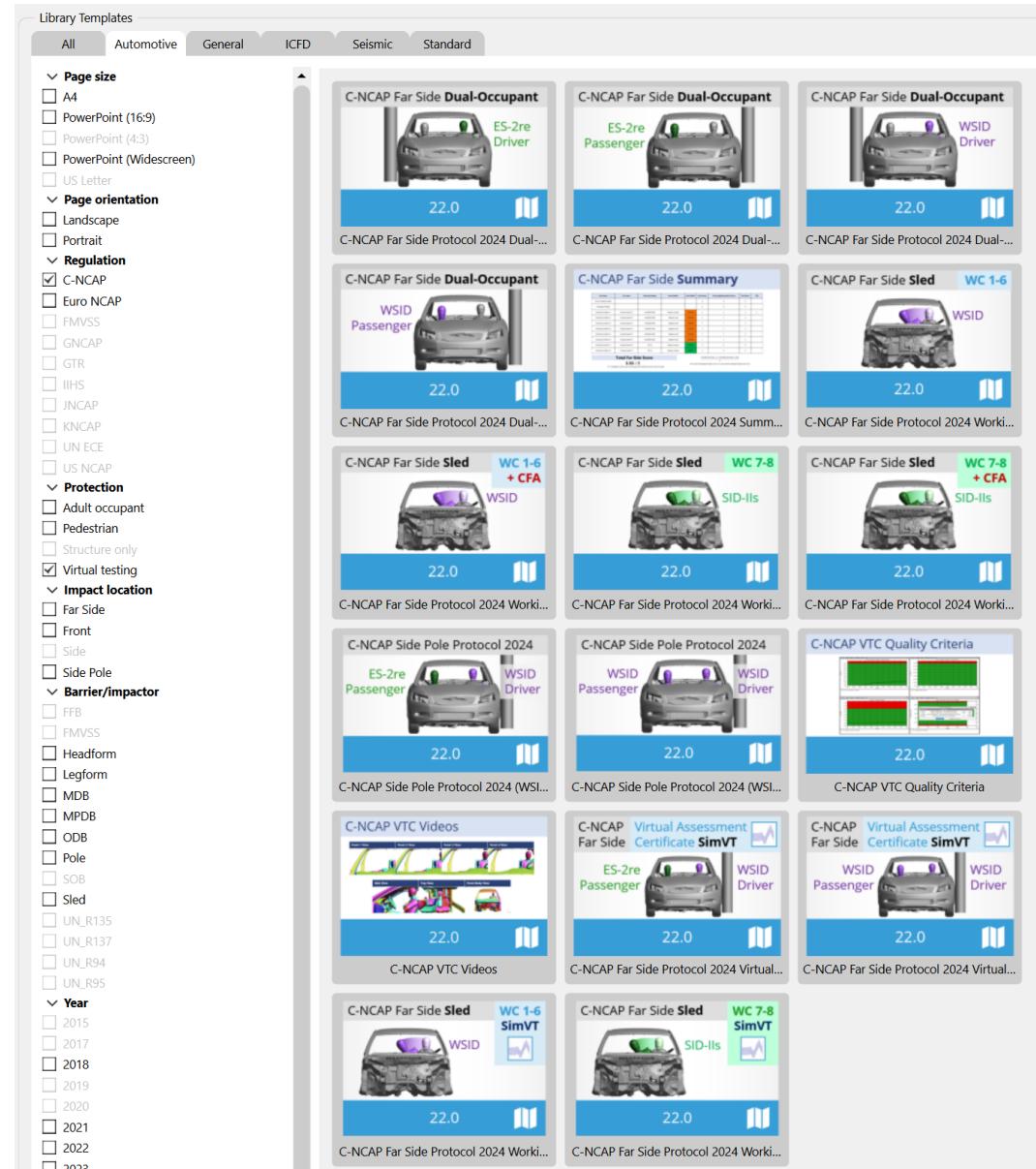
C-NCAP VTC Quality Criteria

- 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.
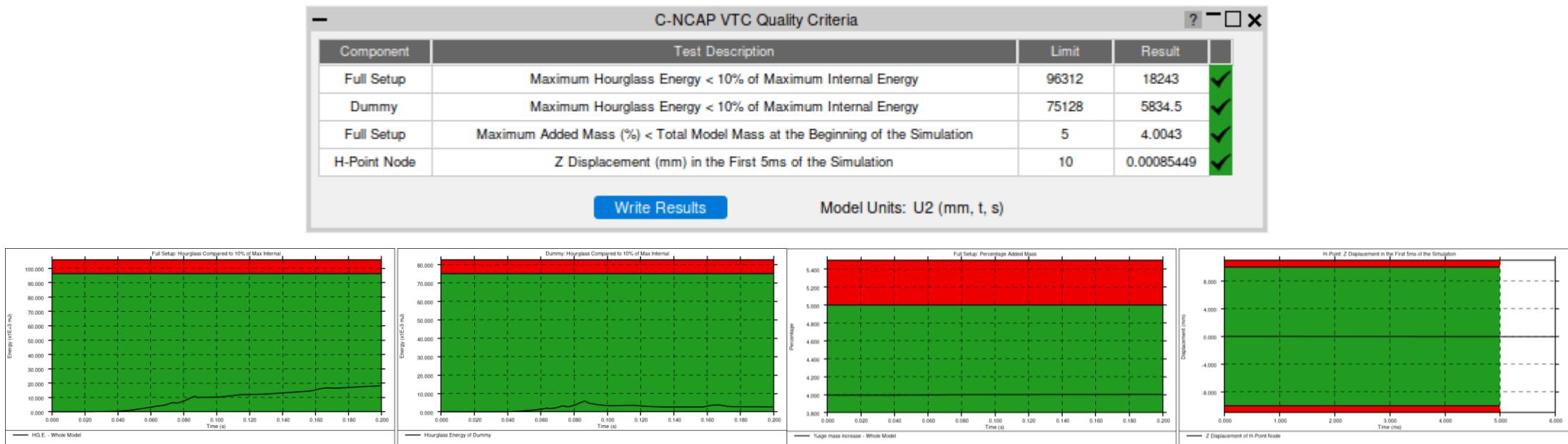
C-NCAP VTC Videos

- 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.
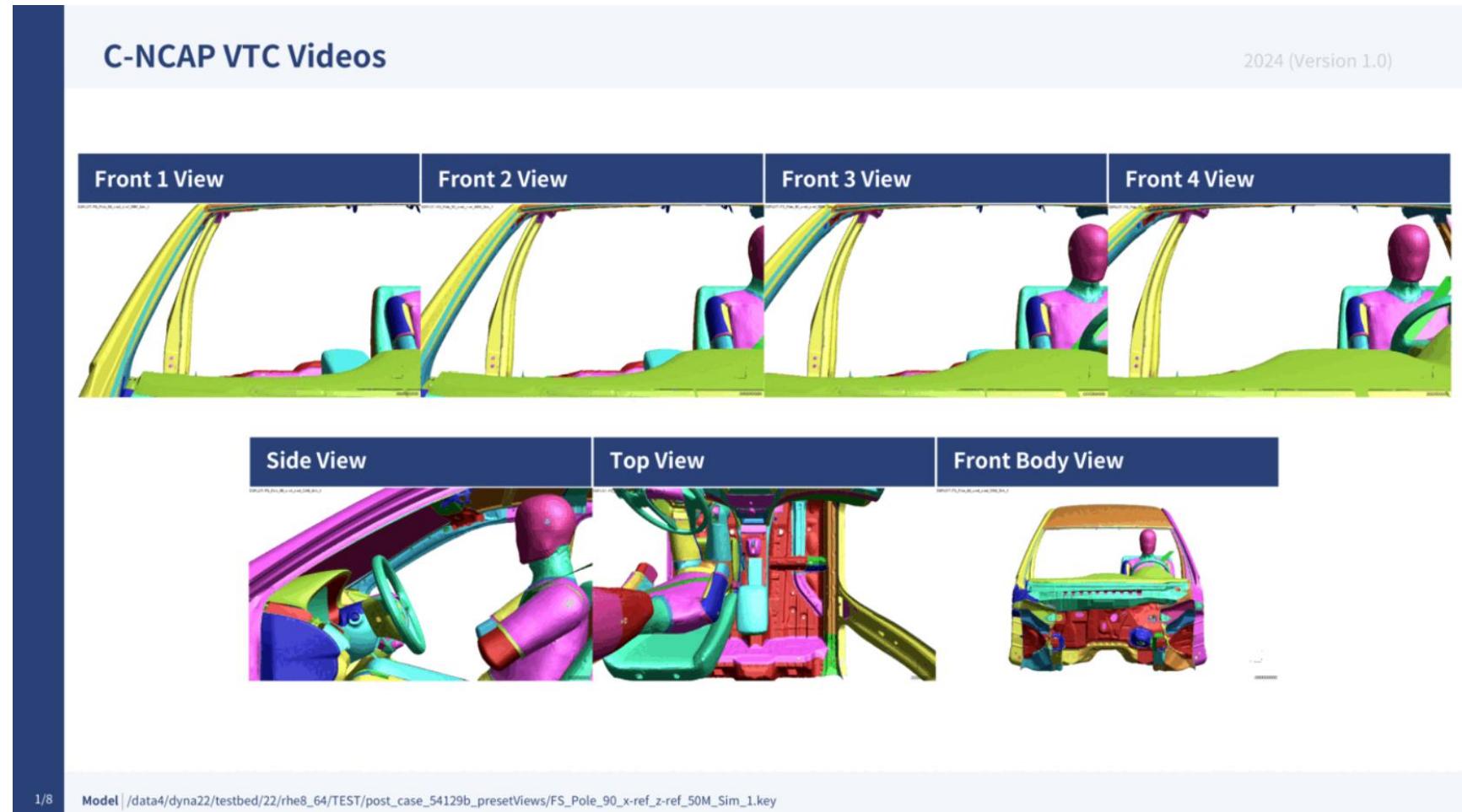
Chinese Language Reports

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。
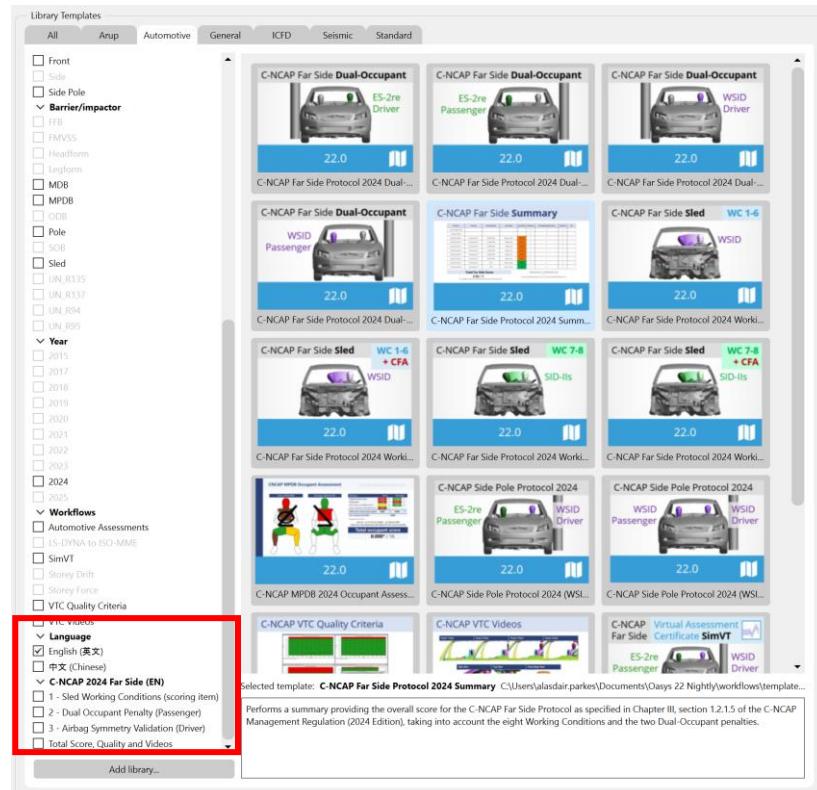
Chinese Language Reports

中文版报告模板
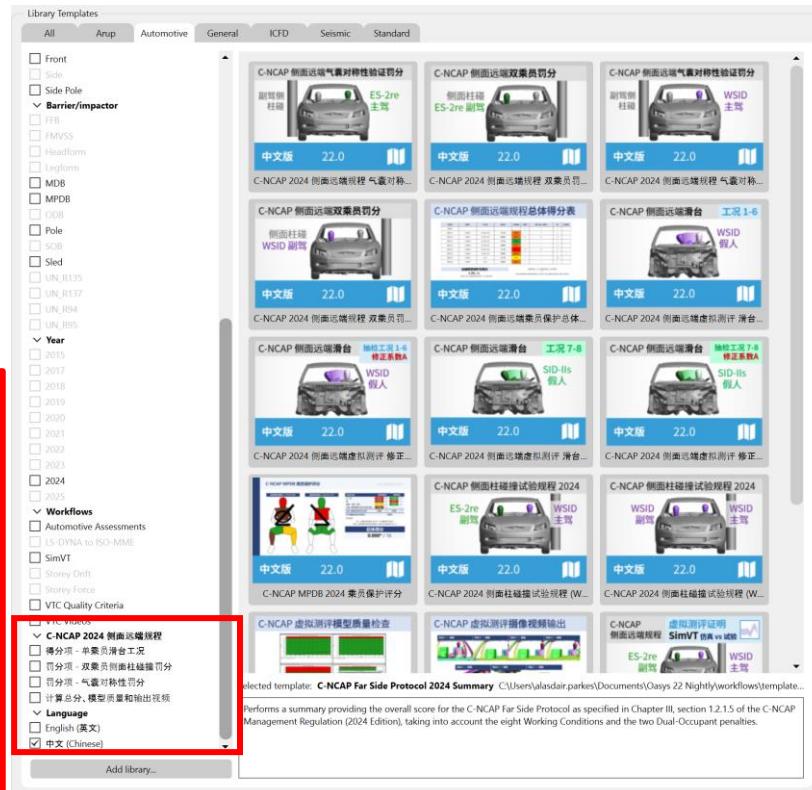
- Example reports generated by C-NCAP REPORTER templates, in English (left) and Chinese (right):

- 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 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.

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

- 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.
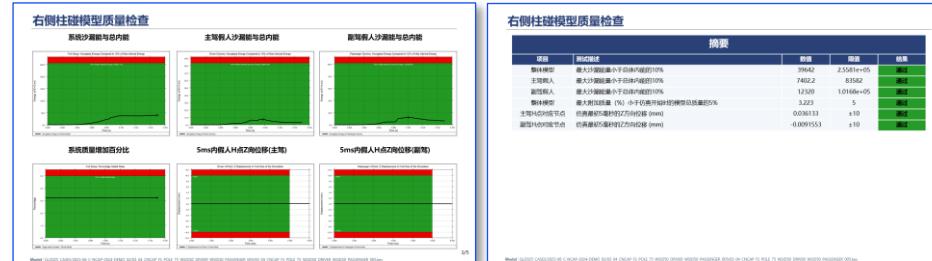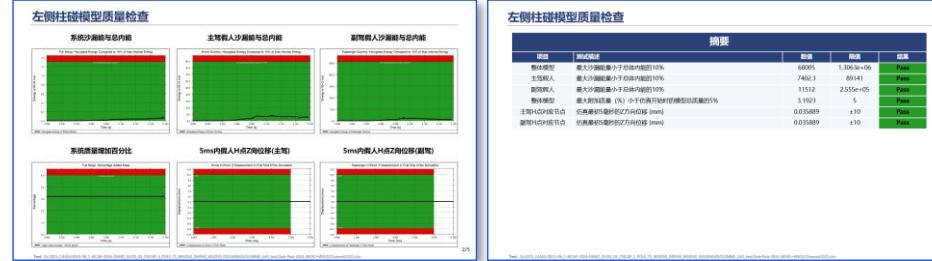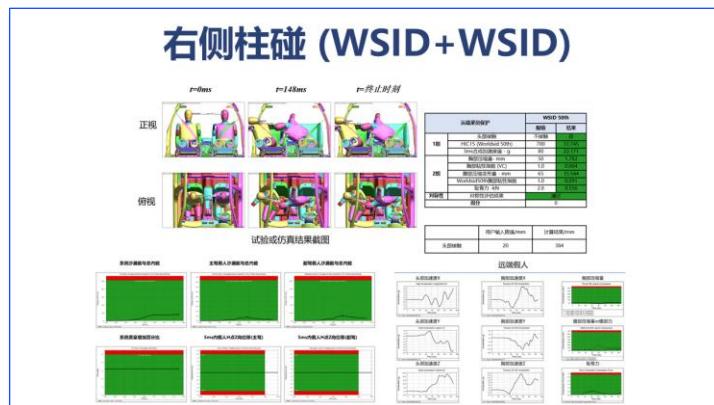
C-NCAP Front AEB OOP 2024 Official Format Template

- 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乘员伤害结果预测曲线

■ 制动阶段离位预测结果（0~500ms）
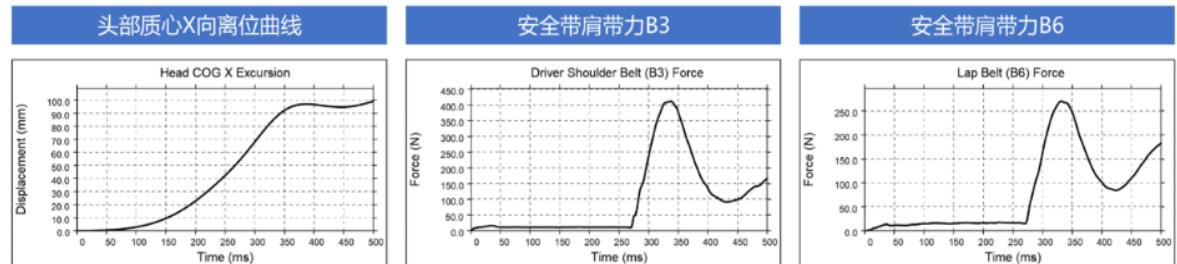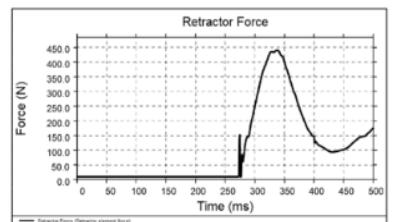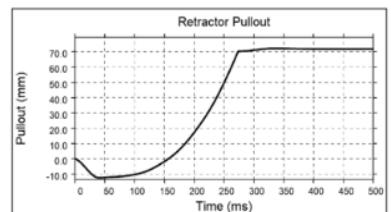
指标	结果
离位阶段头部质心X向最大位移/mm	99.166
卷收器锁止时刻/ms	272.300
卷收器安全带拉出量/mm	72.123

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

全局
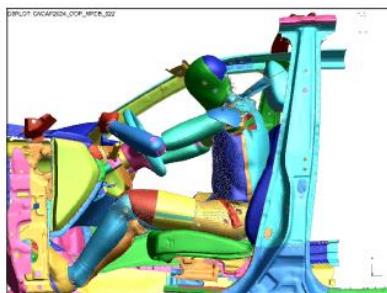
过H点XZ剖视

只有假人、座椅 安全带、气囊的动画
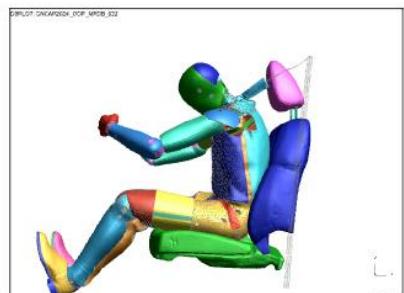
Euro NCAP 2026 Protocols
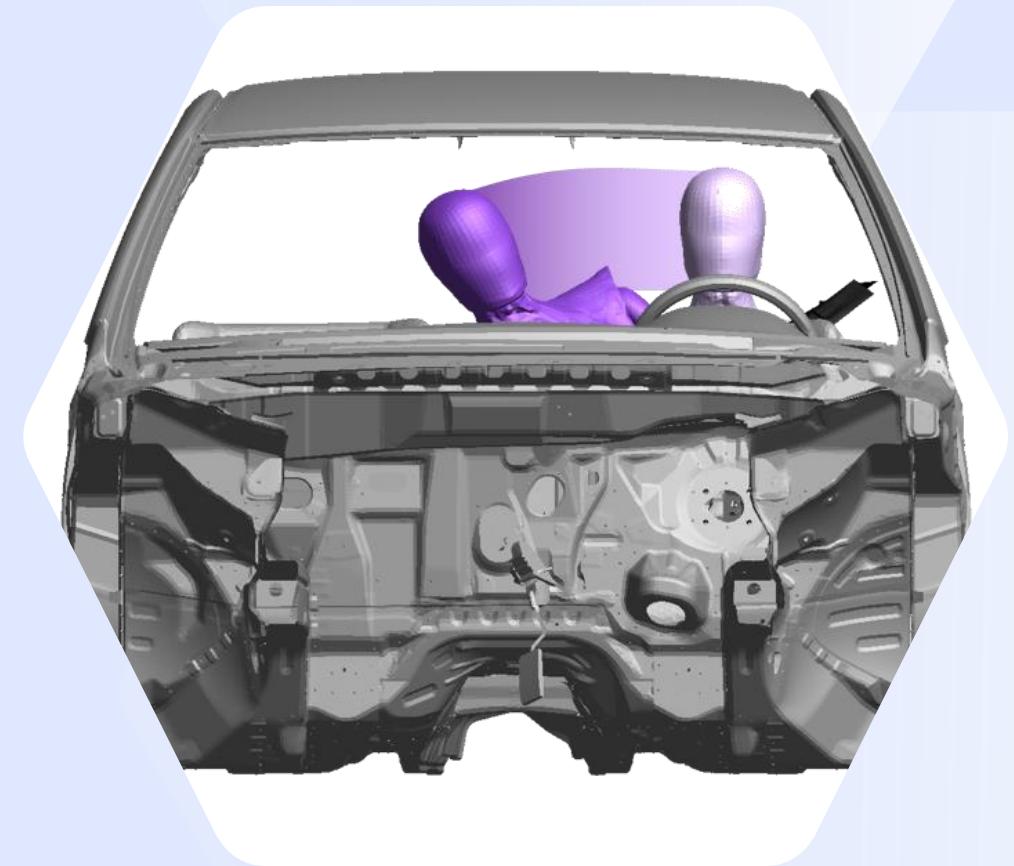
Euro NCAP Virtual Frontal Impact – Overview

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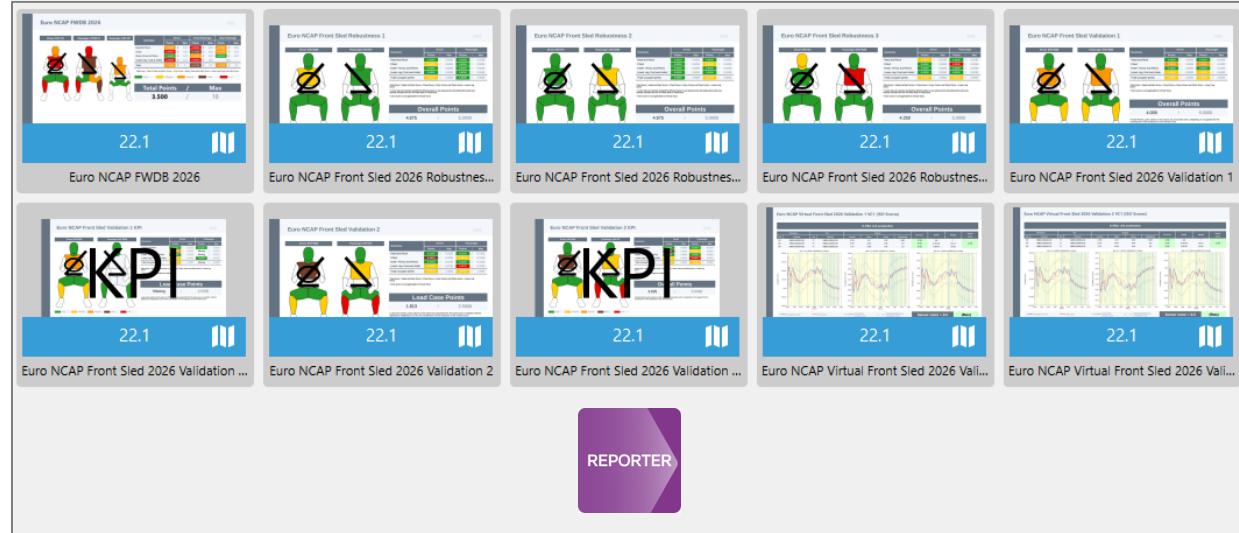
- Please see related documentation:
  - [Euro NCAP FWDB](#)
  - [Euro NCAP Validation](#)
  - [Euro NCAP Validation KPI](#)
  - [Euro NCAP Robustness](#)
  - [Euro NCAP Scoring & Colour Bands](#)
  - [Euro NCAP Points](#)

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.

User data
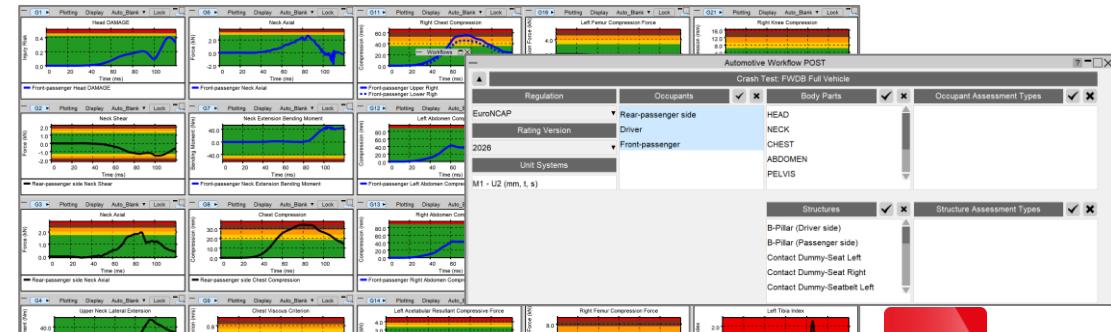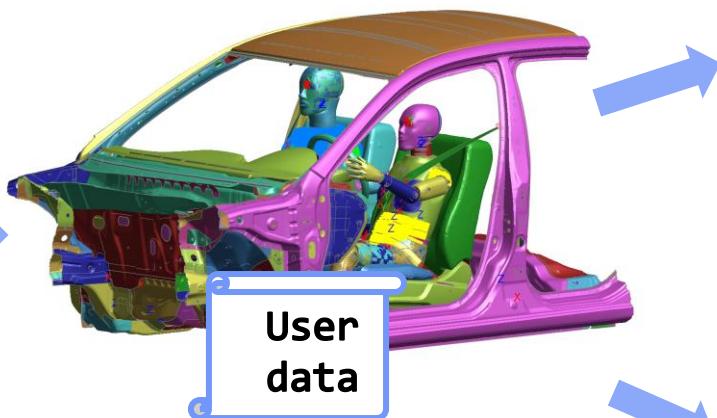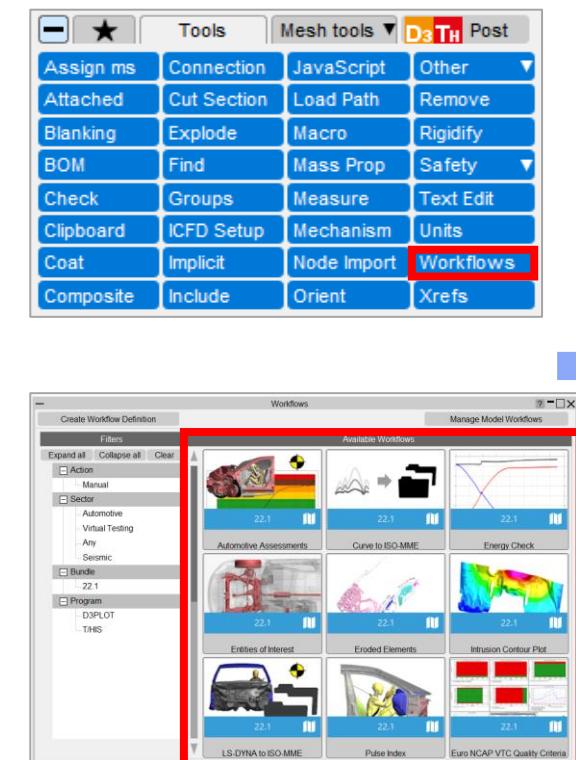
Automotive Assessments in PRIMER

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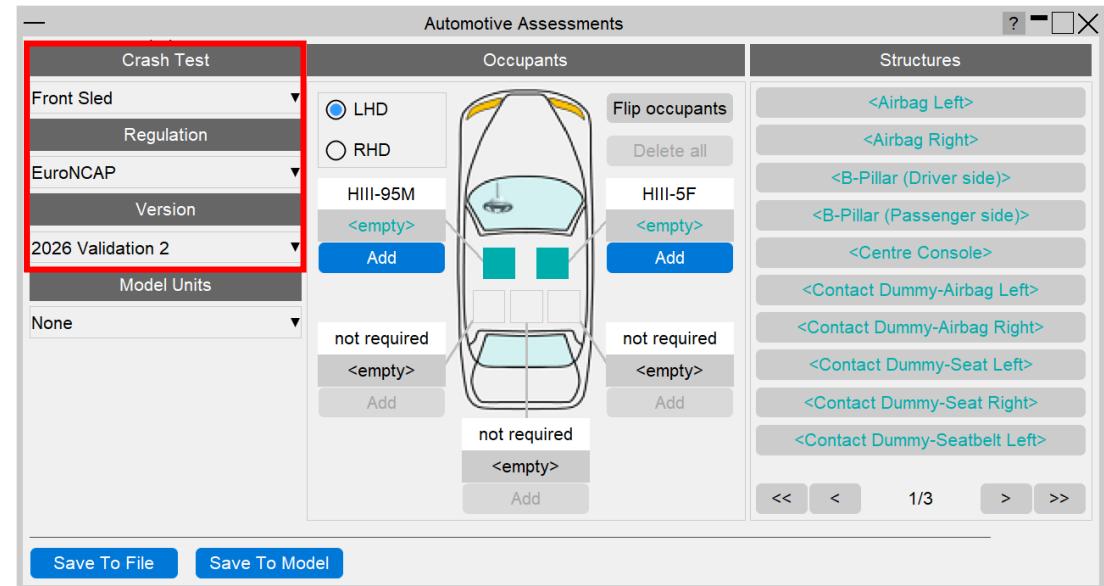
- Thereafter, proceed with setup as you would normally for Automotive Assessments (see Automotive Assessments PRIMER documentation for details)

Oasys LS-DYNA Environment

53

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)
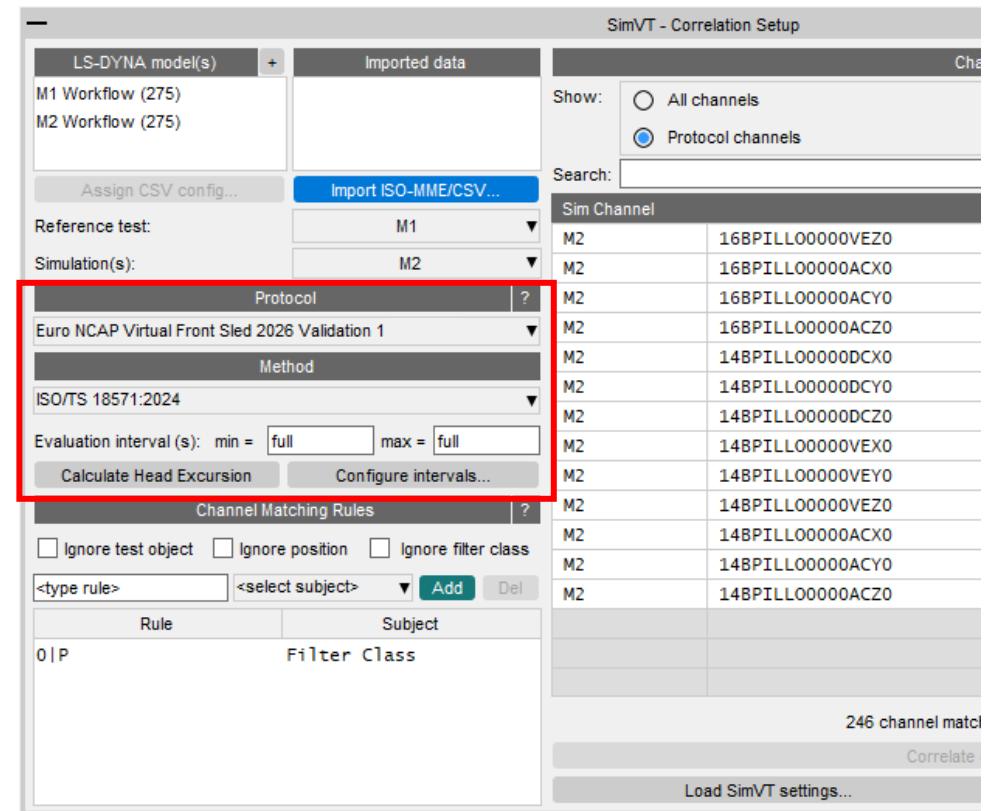
Euro NCAP Virtual Frontal Impact

Preview of Validation 1 KPI
Template
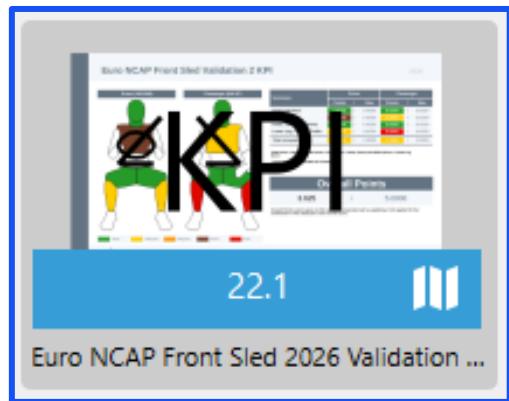
Euro NCAP Virtual Frontal Impact

Preview of FWDB Template

Working with Test Data
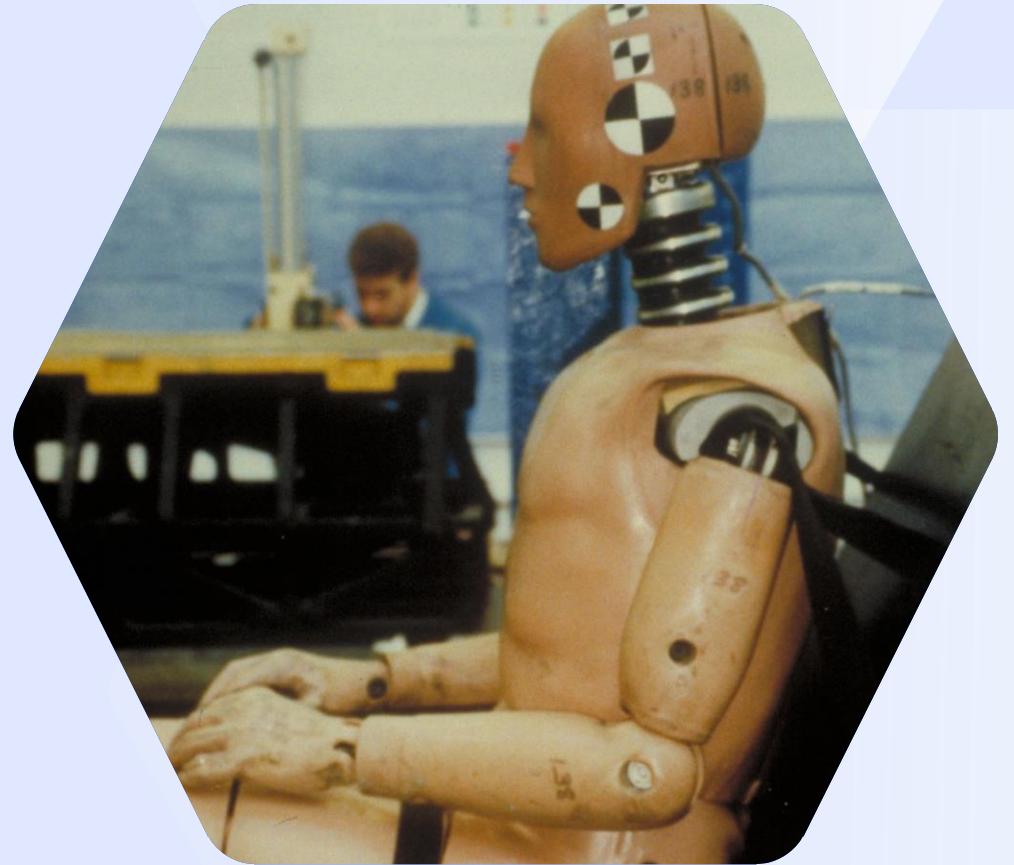
Improved unit handling and configuration for imported data

- 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.

Import Config. File

Configure import

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

Data Imported
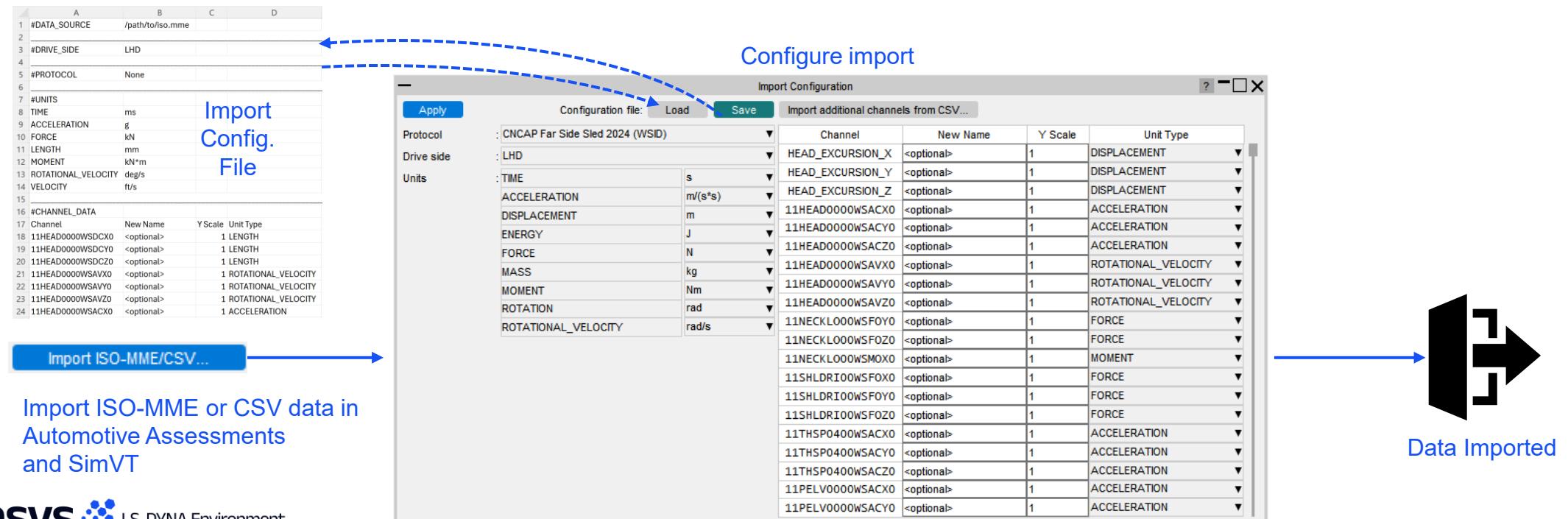
Import C-NCAP head excursion channel data from CSV file

- 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 CNCAP Far Side 2024 protocols).

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.
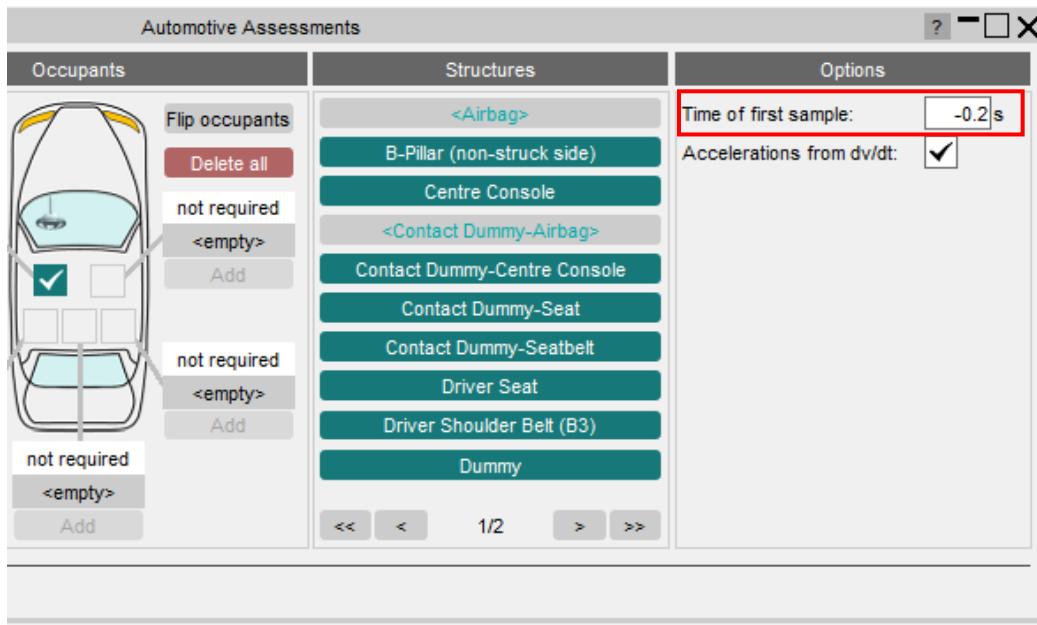
LSDYNA to ISO-MME

- 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

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
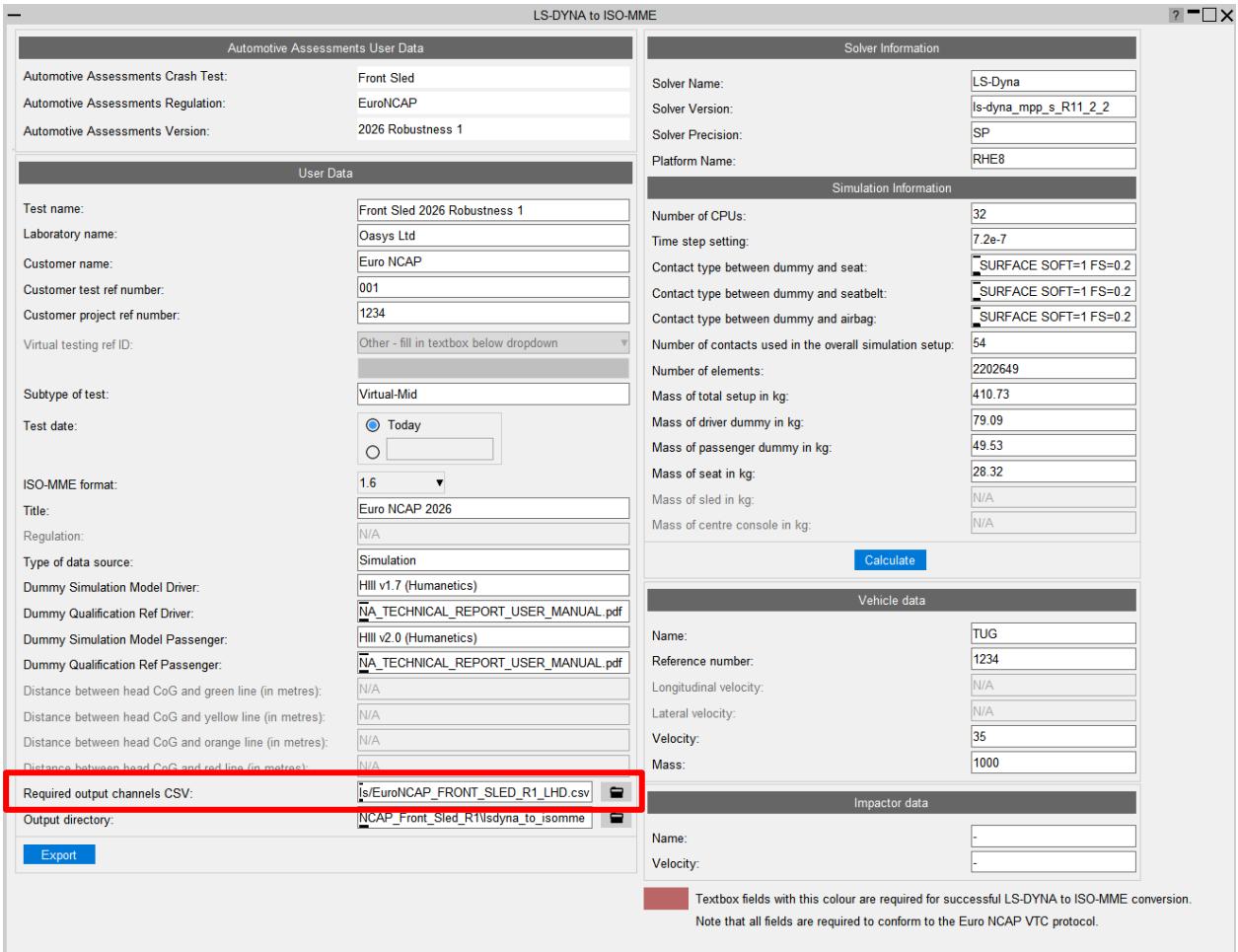
Mass calculation and Platform name update

- 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.

REPORTER Template update

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

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:

- 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.

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
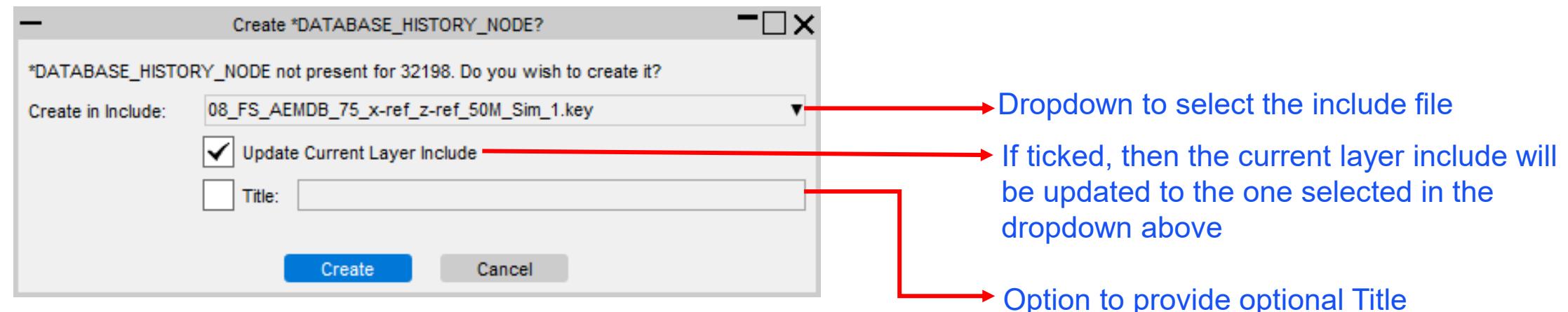
Automotive Assessments Improvements

- 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 (SEBE00**03**B6FO00 to SEBE00**00**B6FO00)

    - Shoulder Belt (SEBE00**03**B3FO00 to SEBE00**00**B3FO00)

    - Contact Dummy-Airbag (**ARBG**0000WSFOX/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.

Oasys ::: LS-DYNA Environment
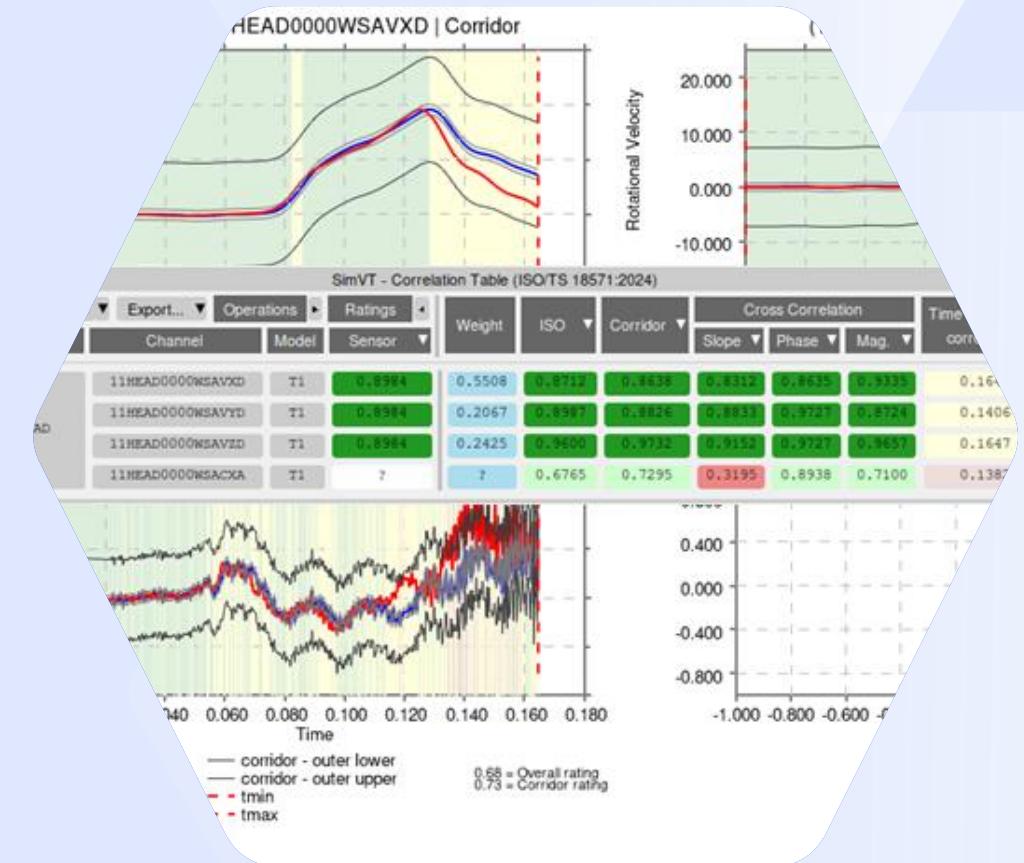
SimVT

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.
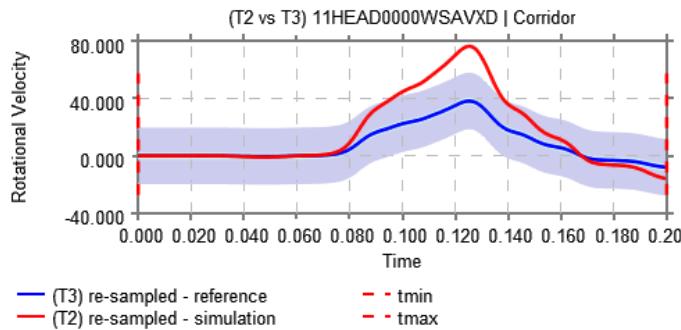
Corridors turned on
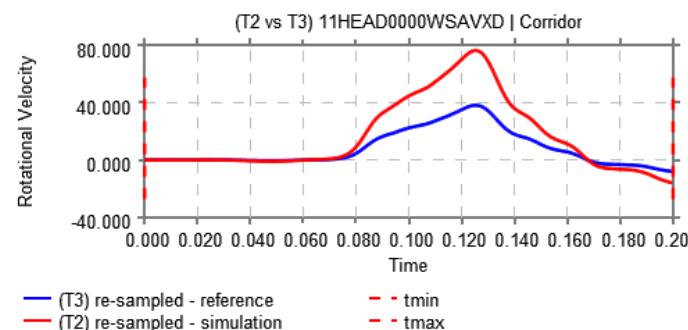
Corridors turned off
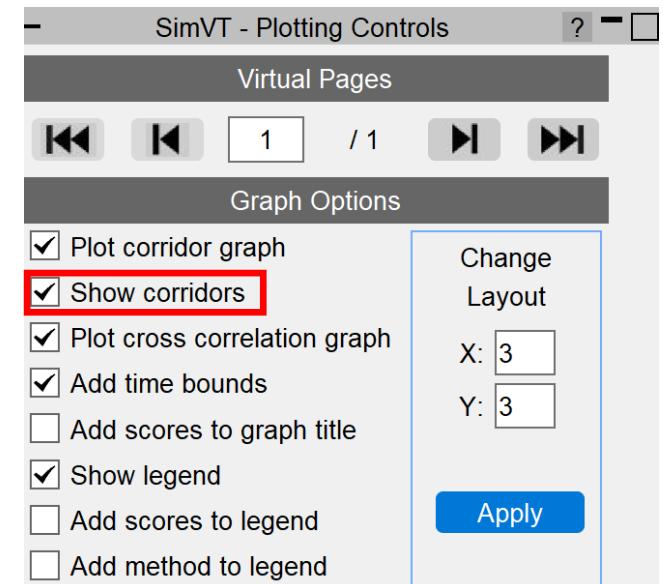
SimVT: Improvements

- The performance of SimVT has improved when loading a large number of channels and when switching the channel table to show "All Channels".
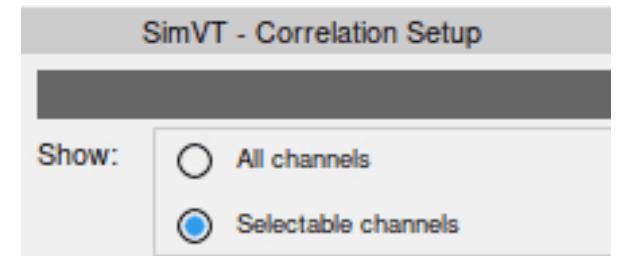
SimVT: Diagnostic Tools

- 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.**

Oasys LS-DYNA Environment
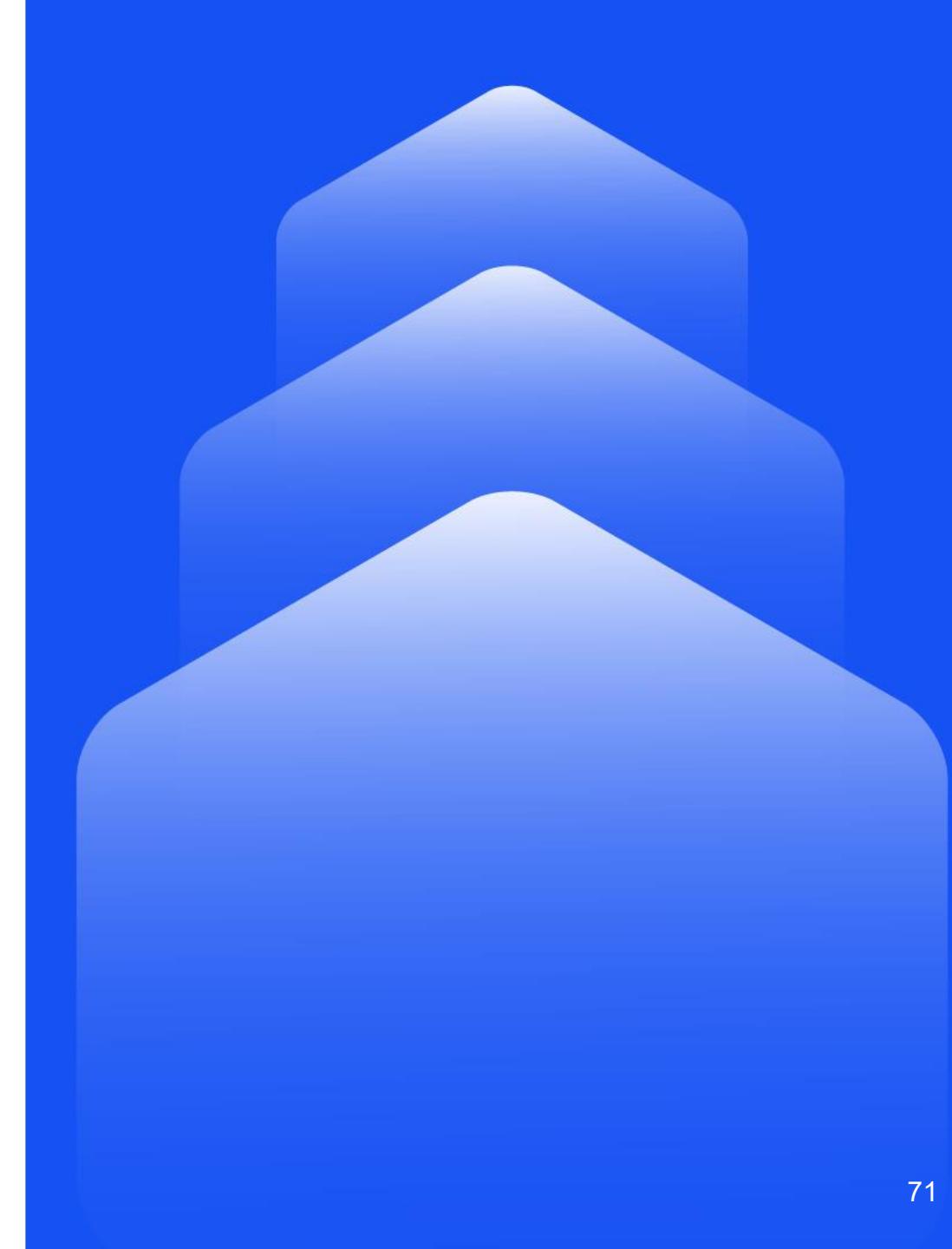
SimVT: Error Graphs when results cannot be correlated

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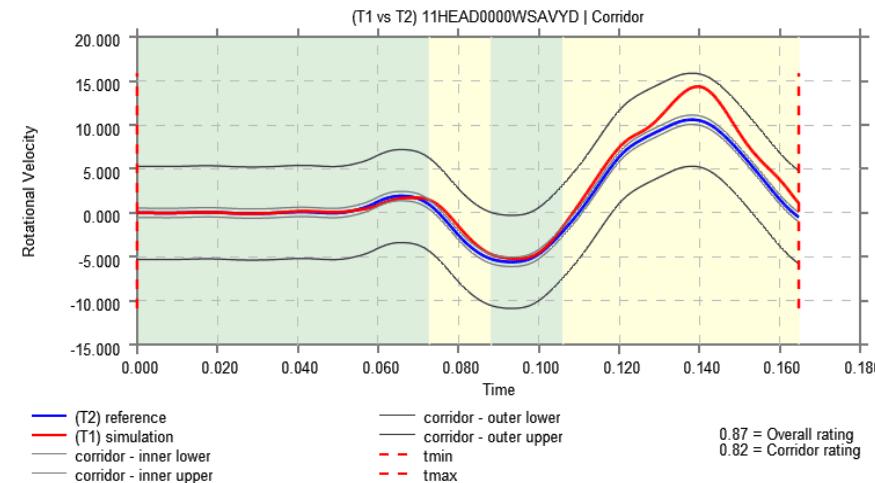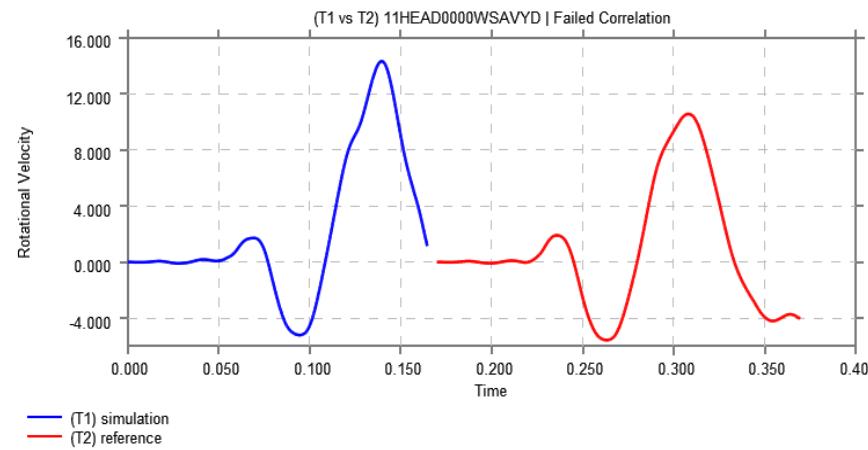
- The curves can be made to overlap using the operations panel available in the Correlation Table (e.g. by using ADDX, etc to meaningfully shift the simulation curve in time to overlap).

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

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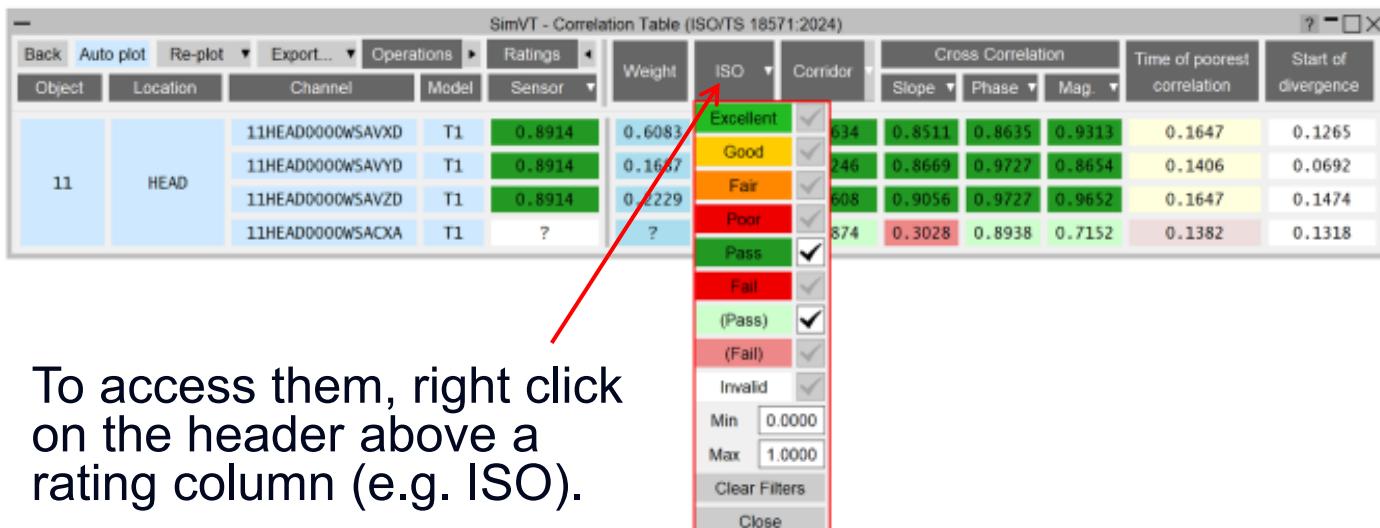
To access them, right click on the header above a rating column (e.g. ISO).

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.
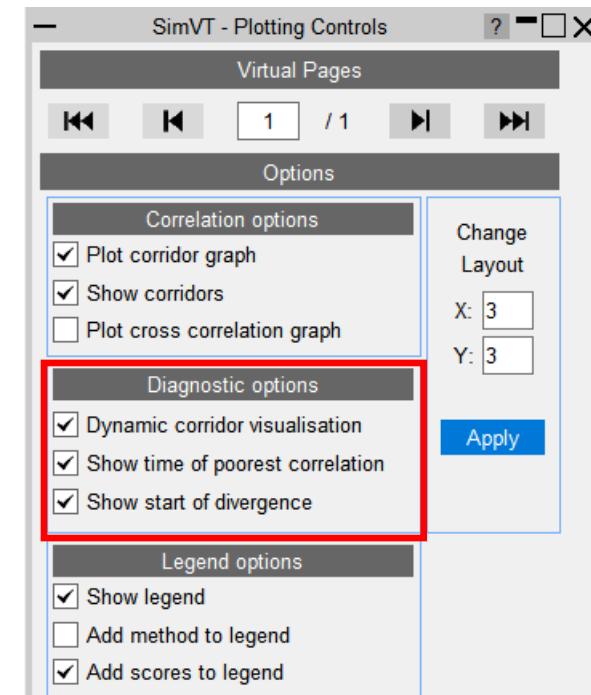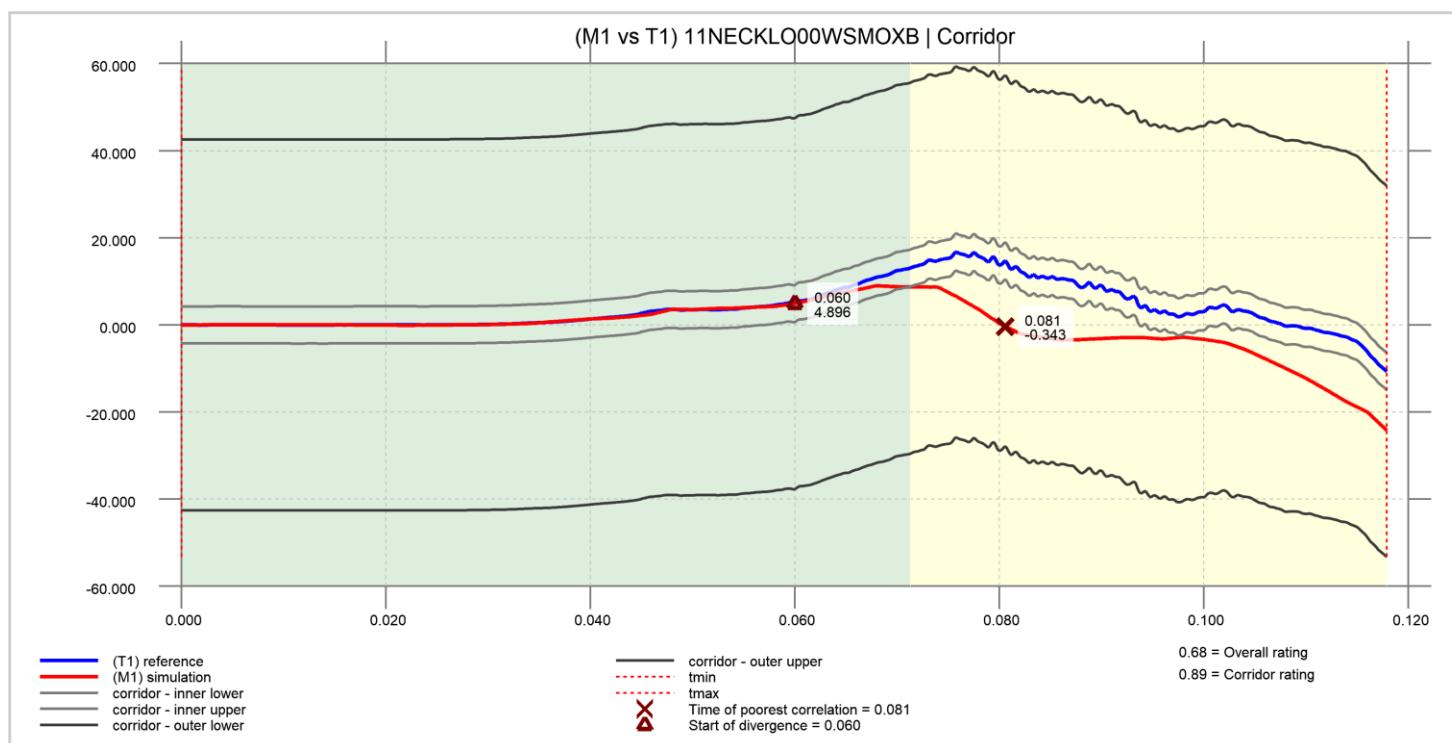
SimVT: Overlaying multiple model results

- 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).
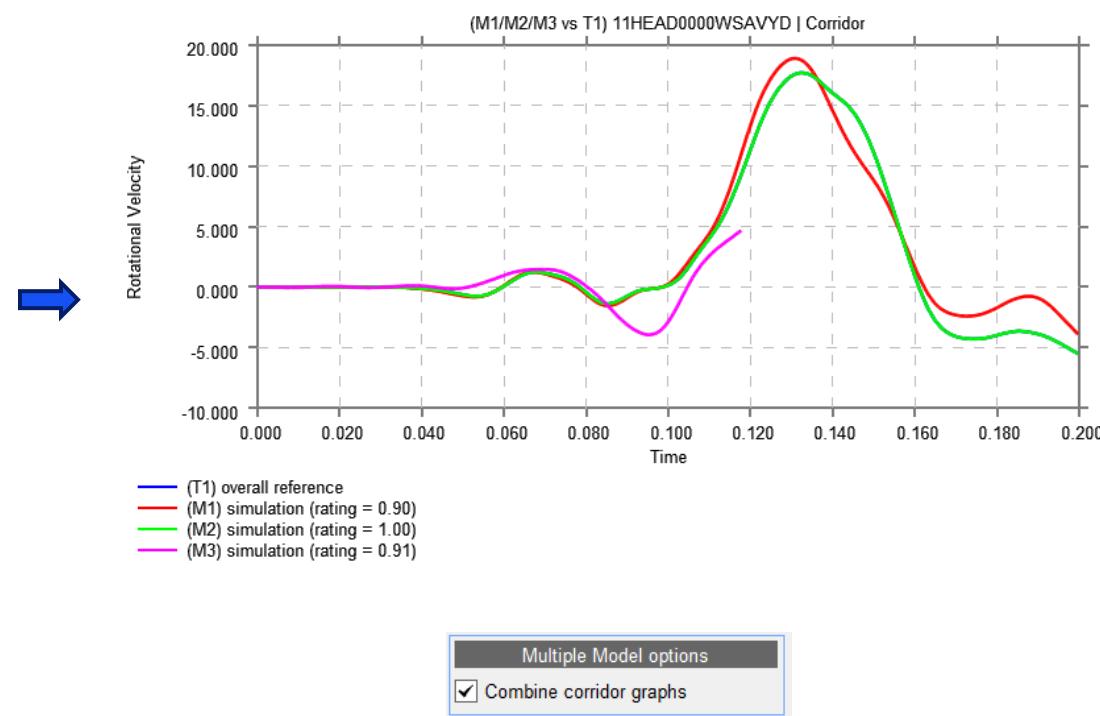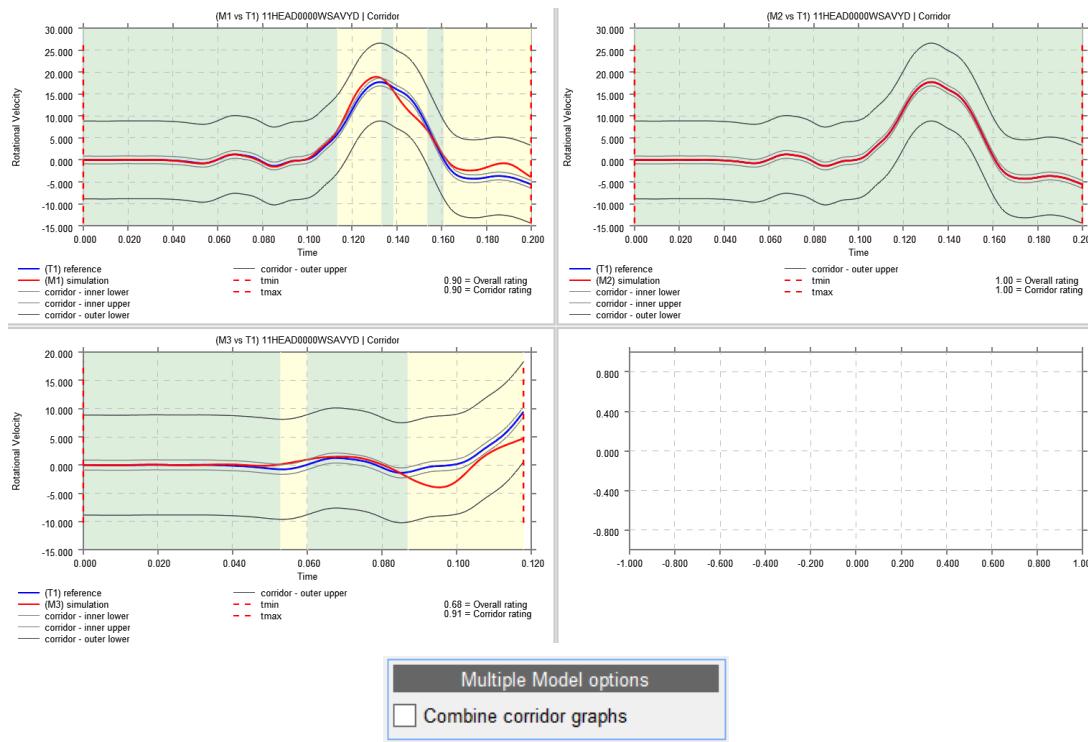
VTC Quality Criteria Workflows
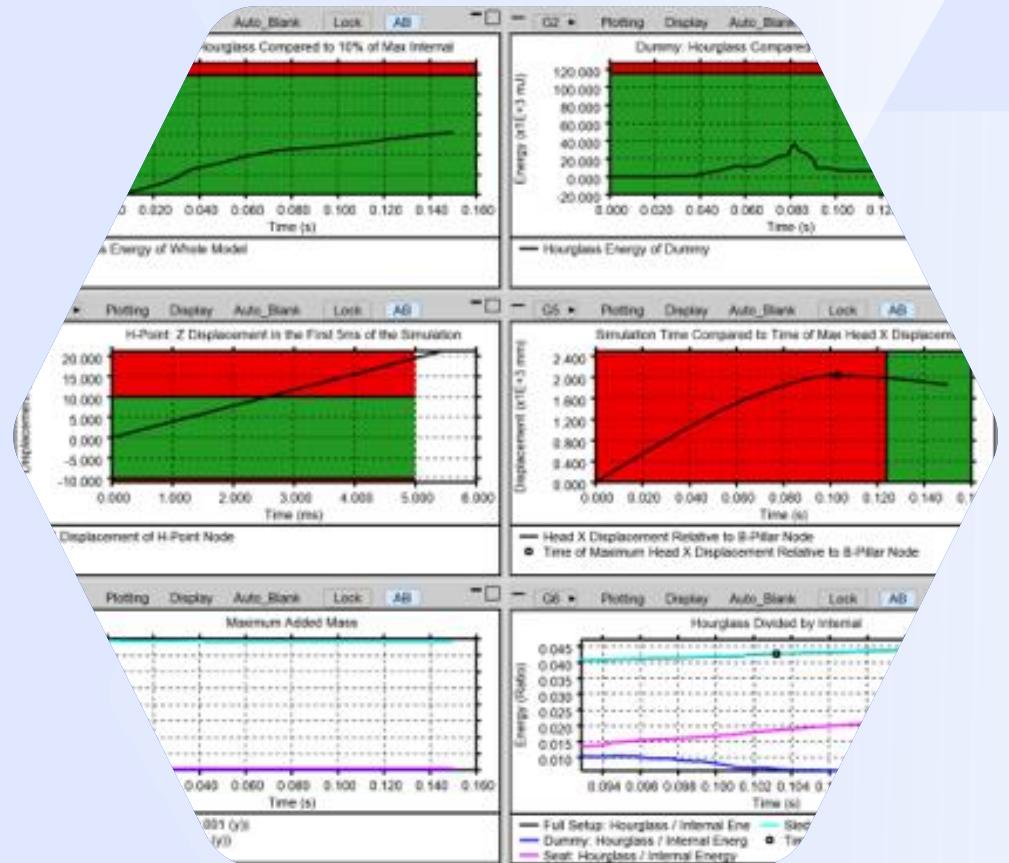
Quality Criteria – Euro NCAP Frontal

- 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.
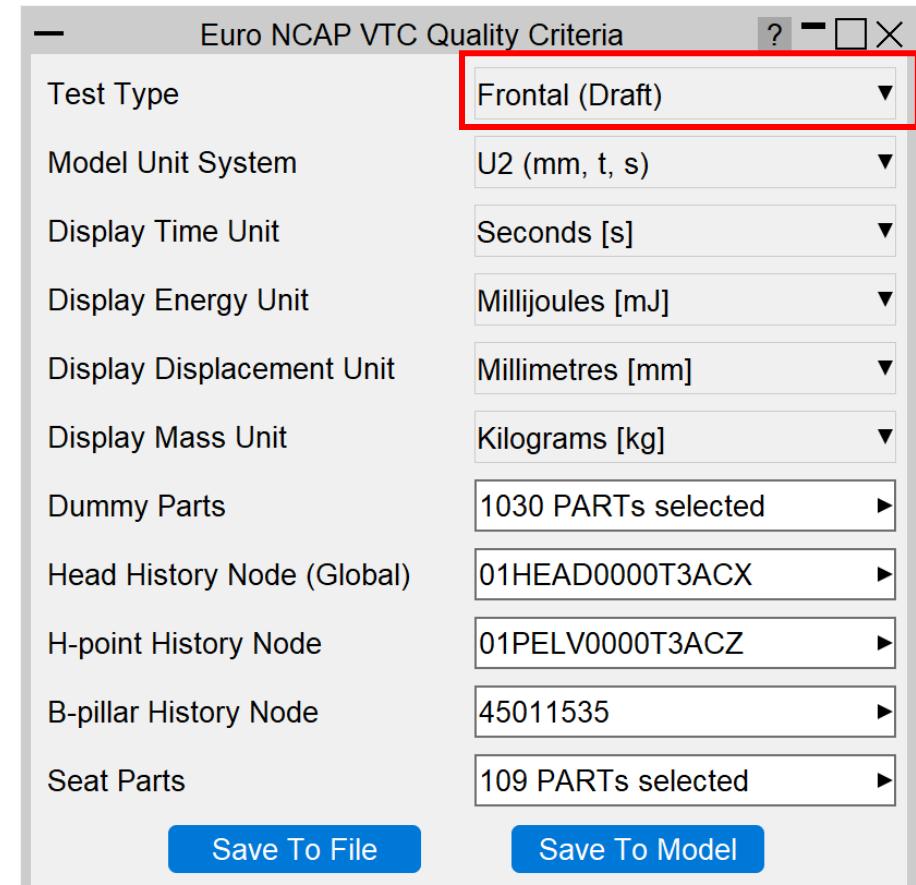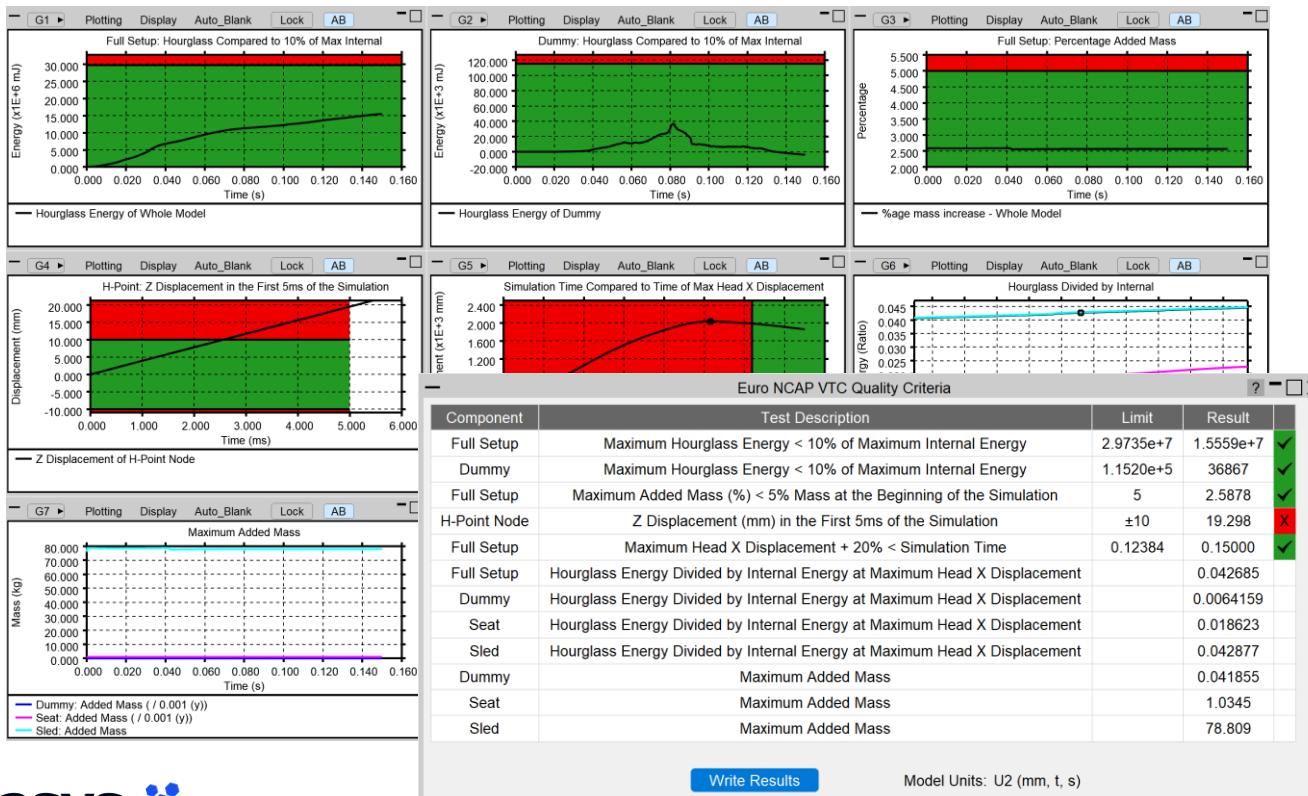
Quality Criteria – Euro NCAP HBM

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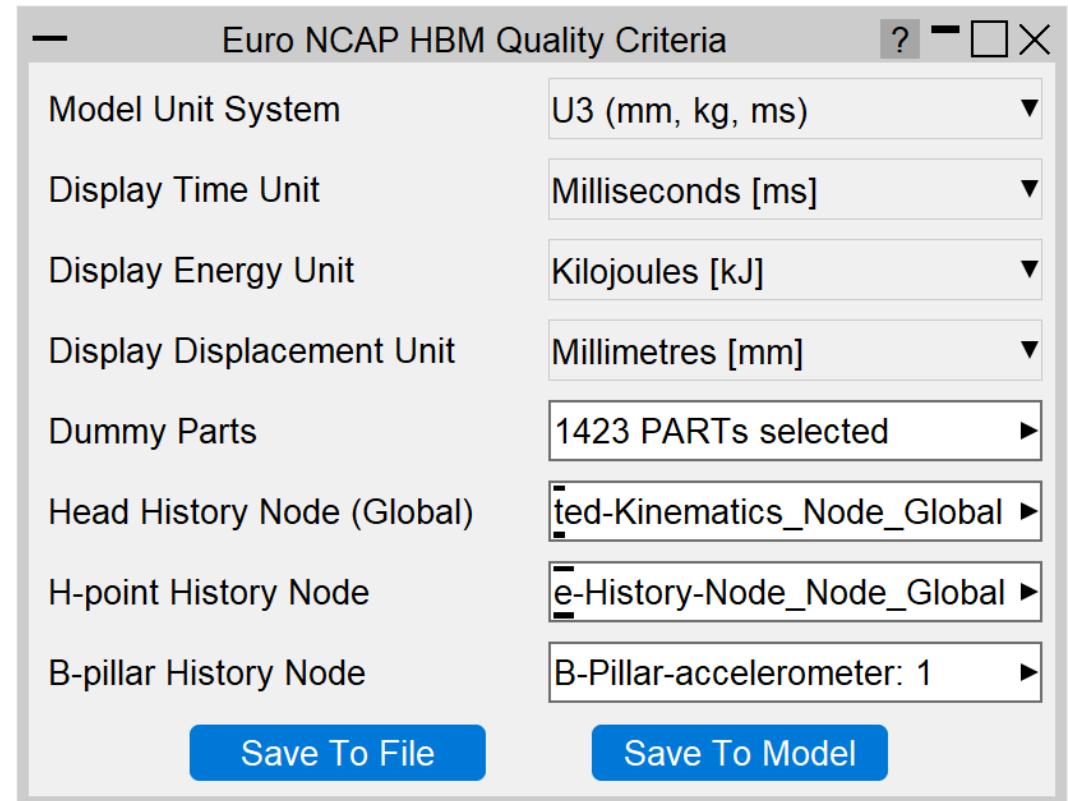
Quality Criteria: C-NCAP Occupant to Occupant (Dual Occupant)

- 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.
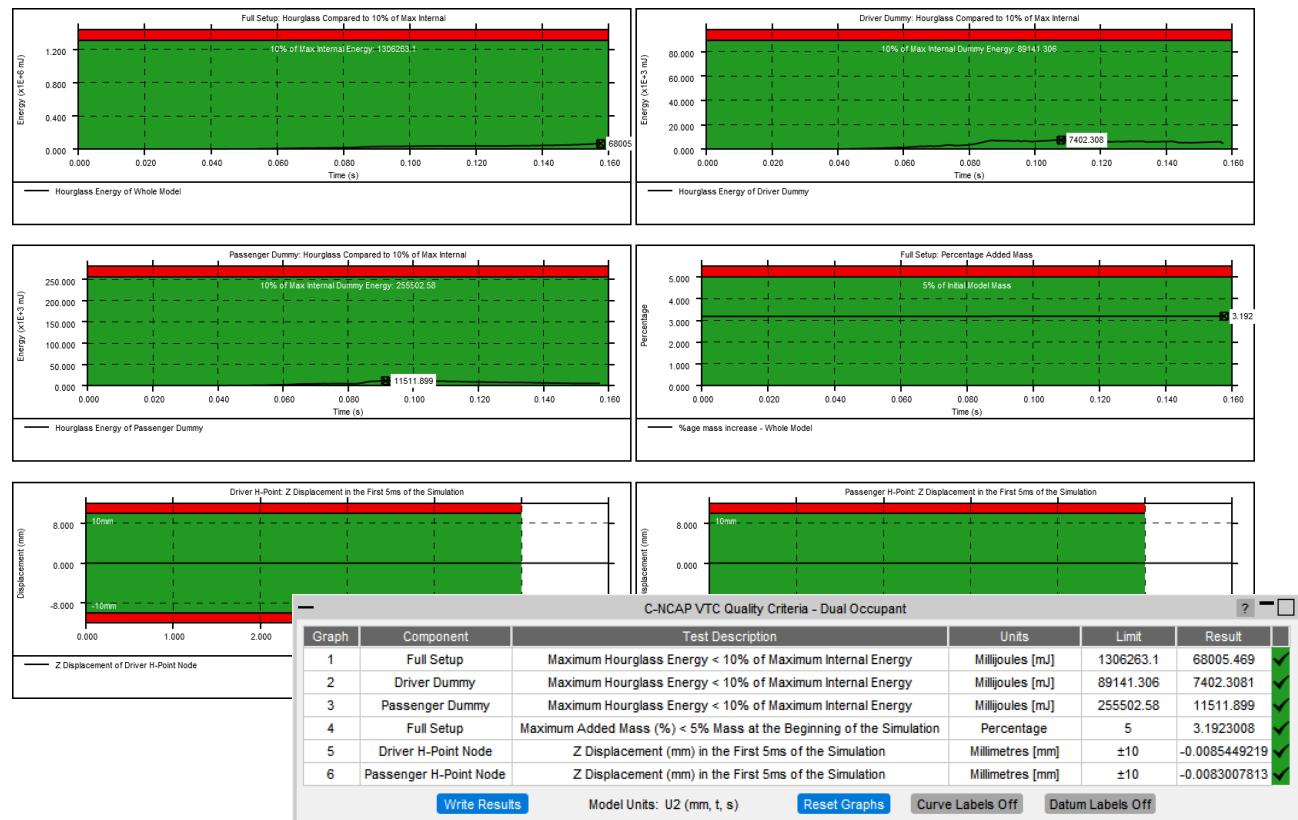
Quality Criteria: C-NCAP Front AEB OOP 2024

- 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.
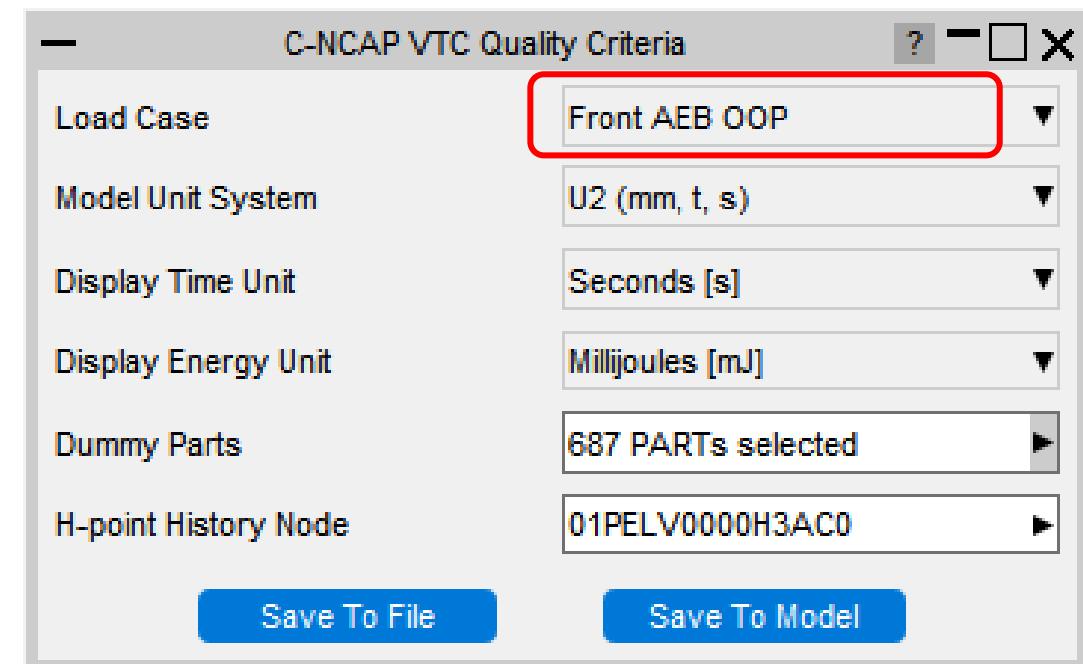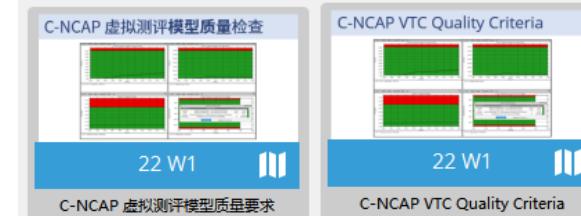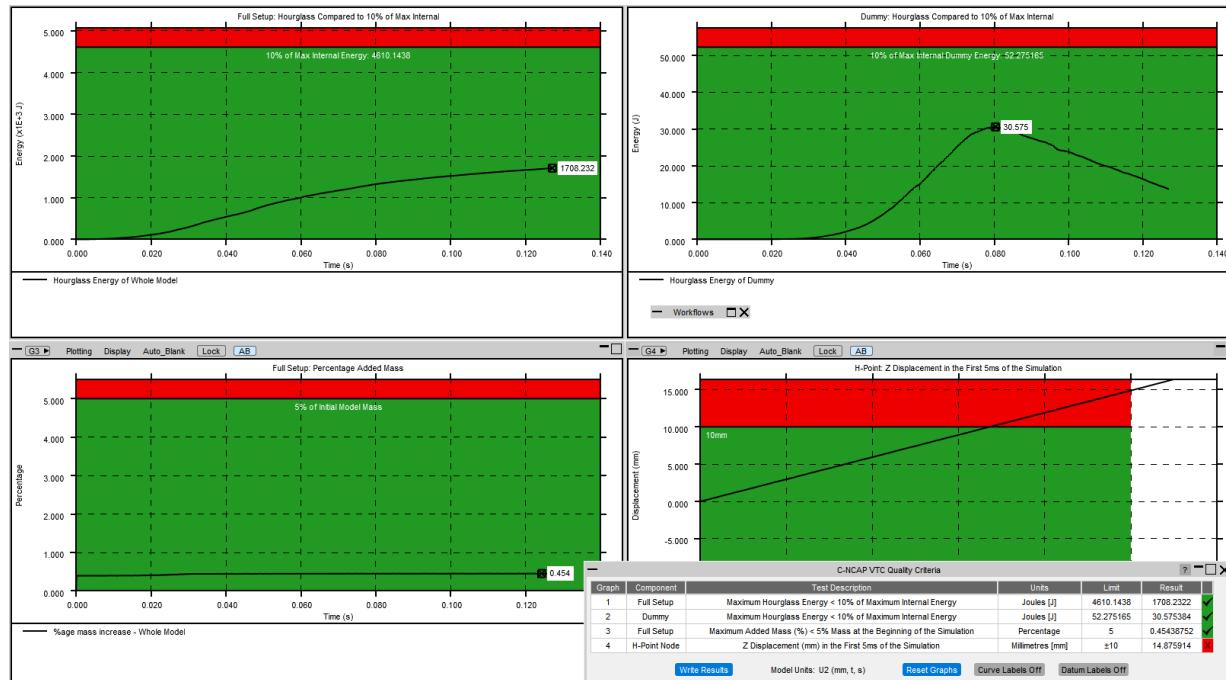
VTC Videos Workflows
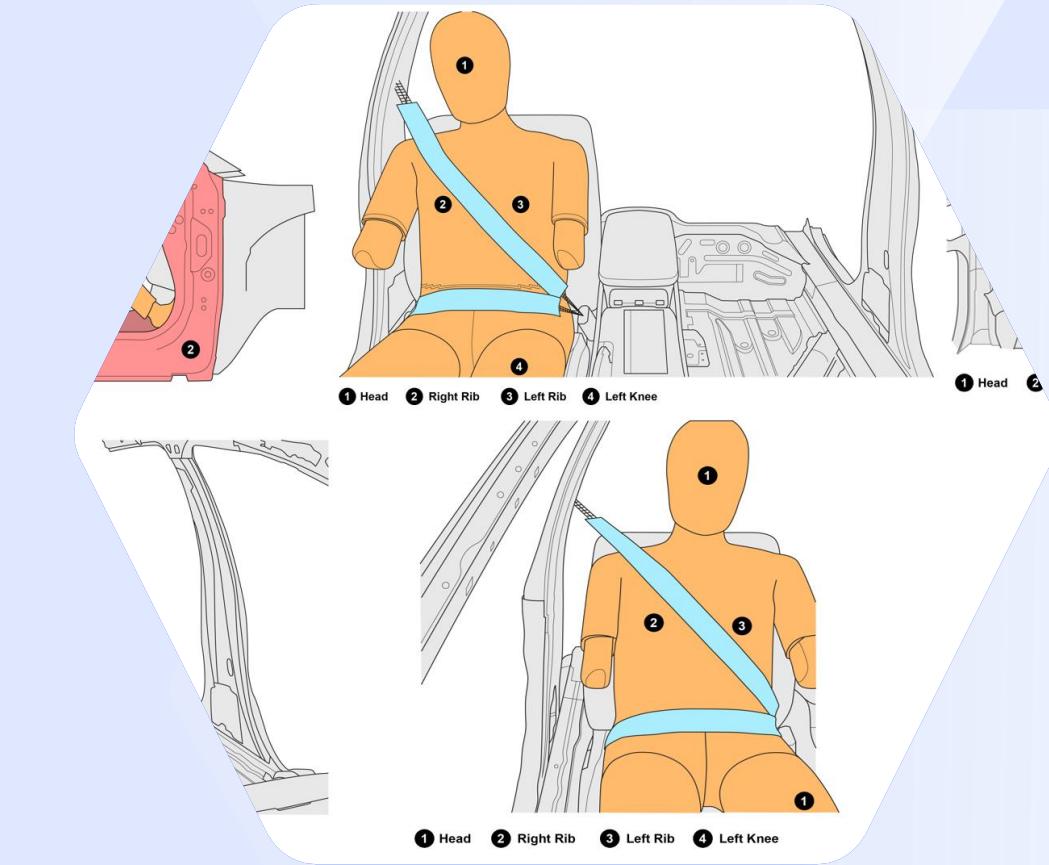
VTC Videos Updates in PRIMER

- 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

Euro NCAP Far Side	☐ ▢ ✕
Protocol	Euro NCAP Far Side ▾
Reference ID	FS_Pole_75_x-ref_z-ref_50M_Sim_1 ▾
Unit System	None ▾
*DATABASE_BINARY_D3PLOT DT	[ ] Save DT
Head Node	[ ] ▶
Dummy Parts	[ ] ▶
Fixed Reference Node 1 (required)	[ ] Select...
Fixed Reference Node 2 (optional)	[ ] Select...
Fixed Reference Node 3 (optional)	[ ] Select...
Parts to Blank	[ ] ▶
Property Files Directory	[ ] 📁
○ LHD	?
○ RHD	Save To File Save To Model

Oasys ∴ LS-DYNA Environment

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.

Oasys LS-DYNA Environment
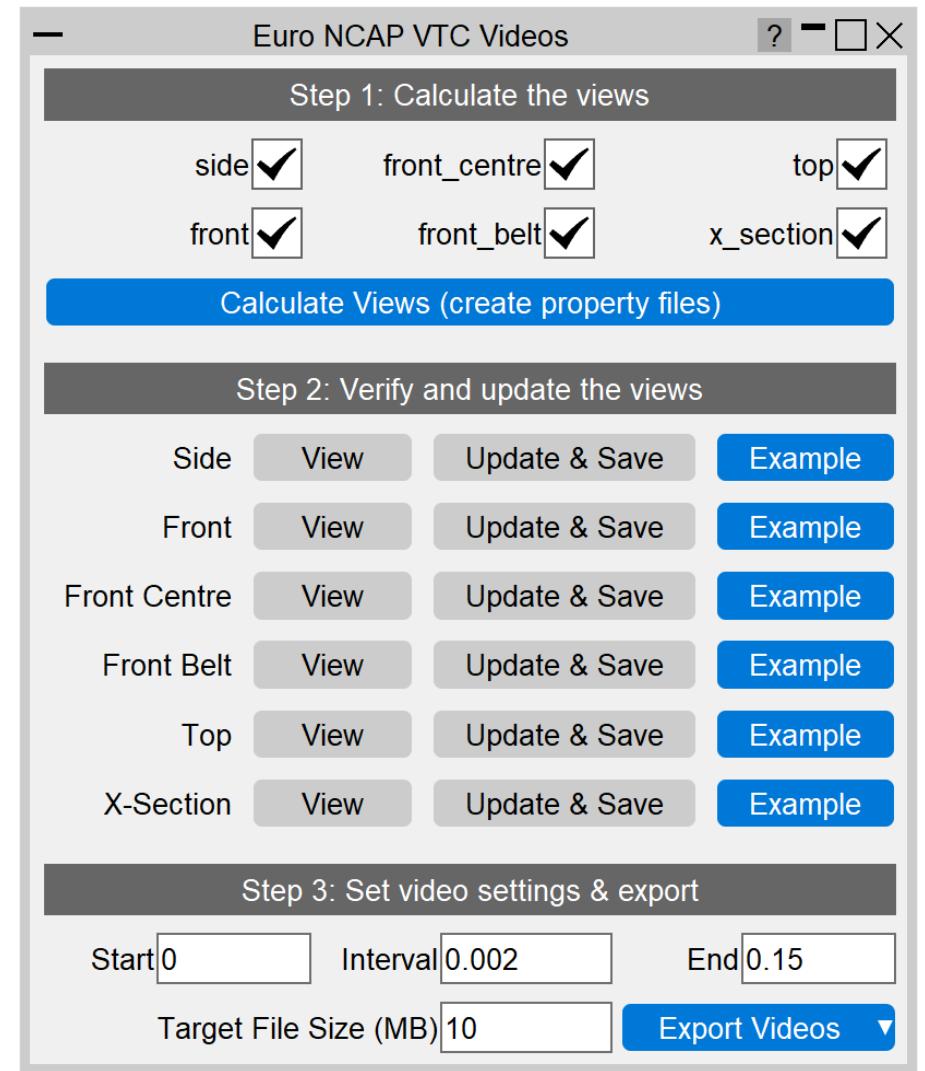
VTC Videos new protocol: C-NCAP Occupant to Occupant

- 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.
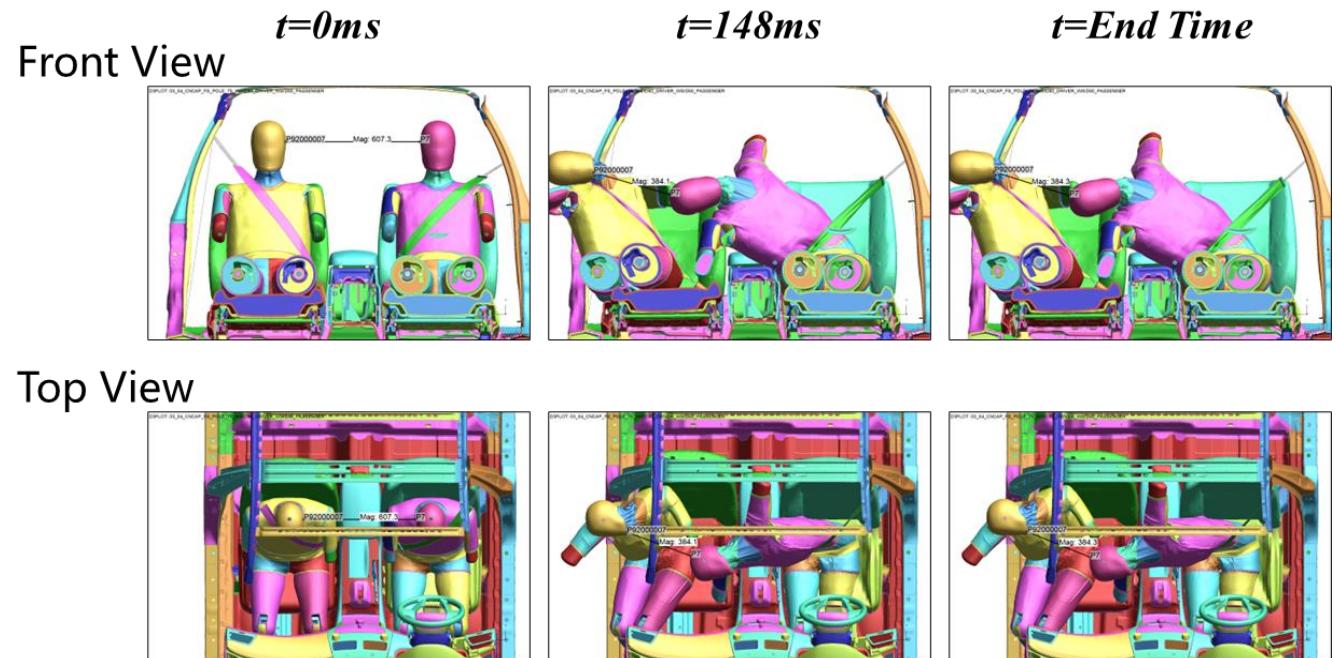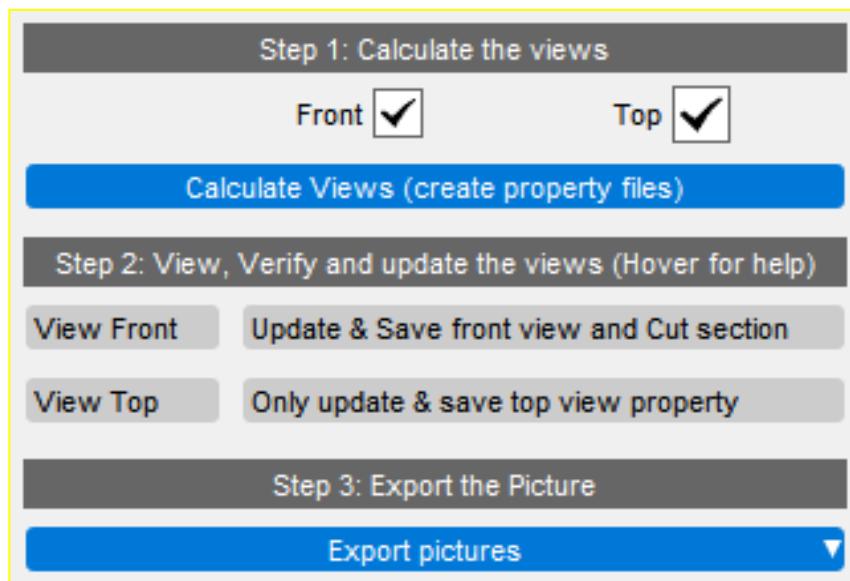
VTC Videos new protocol: C-NCAP Front AEB OOP

- 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
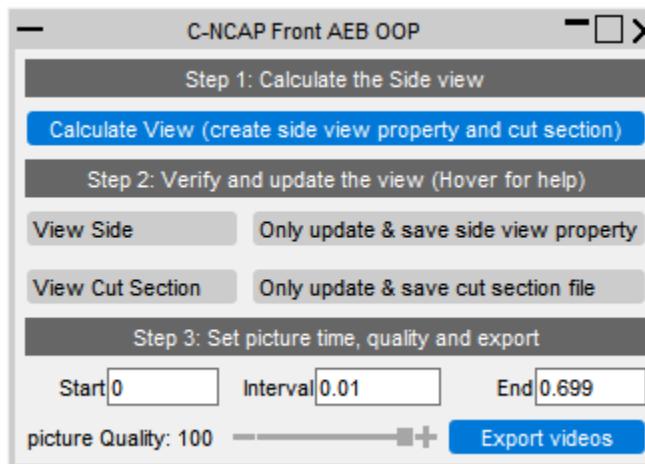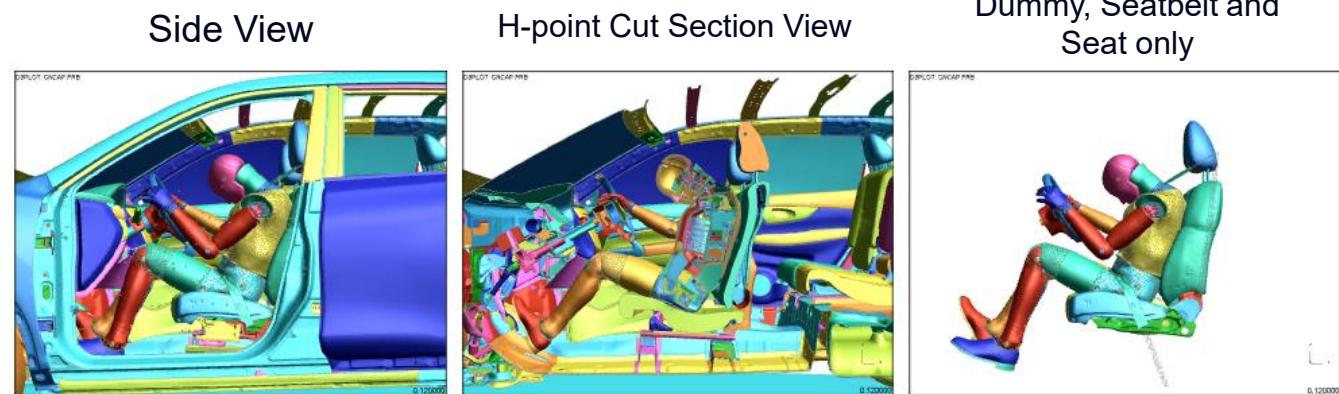
Videos for OOP + FRB / OOP + MPDB

Side View | H-point Cut Section View | Dummy, Seatbelt and Seat only

Oasys LS-DYNA Environment

Workflows

Oasys LS-DYNA Environment
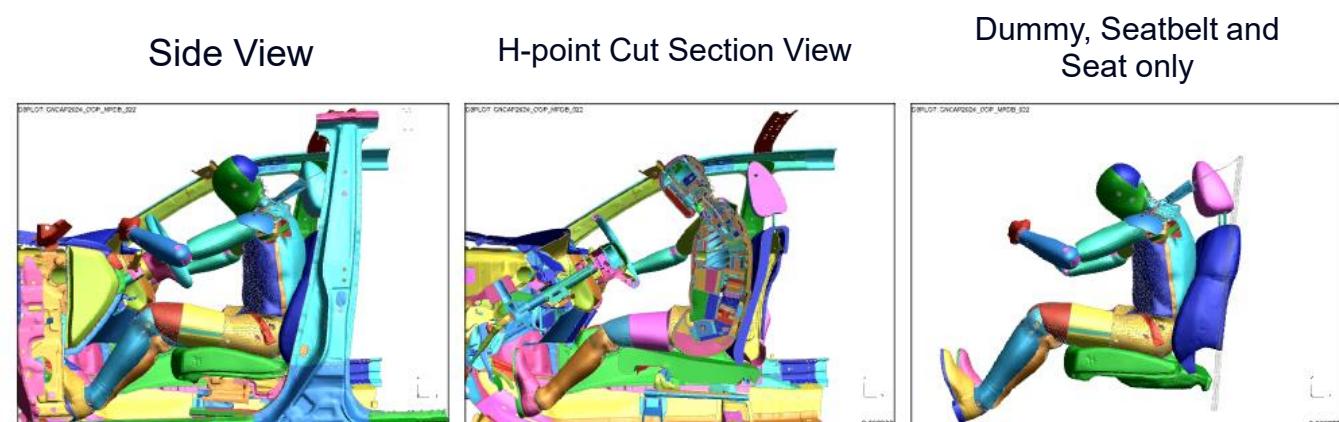
Pulse Index Workflow (PI)

- 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.

22.0
Pulse Index
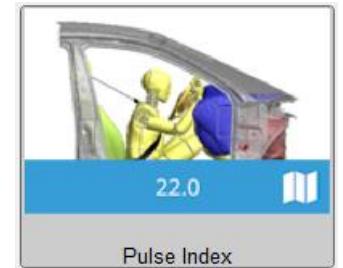
Model

Units: U1 (m, kg, s) ▾

Parameters

Initial velocity (m/s): 15.6

Restraint stiffness (per unit mass) (N/m/kg): ◉ Constant → 2000 ⟶ Stiffness now per unit mass
○ Variable — Select curve   T: 0.1405 s ⟶ Time period relating to current stiffness

Slack (m): 0

Measurement node: X-Axis ▾

Display Units

Time Units: Seconds [s] ▾   Acceleration Units: ◉ g
Displacement Units: Metres [m] ▾   ○ Display Units
Acceleration Filter: C60 ▾   Read Velocity: ☐ ⟶ Take acceleration as a differentiated velocity curve

Save to file   Save to model ⟶ Select filter applied to the acceleration curve

Connections Enhancements

Oasys LS-DYNA Environment

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.
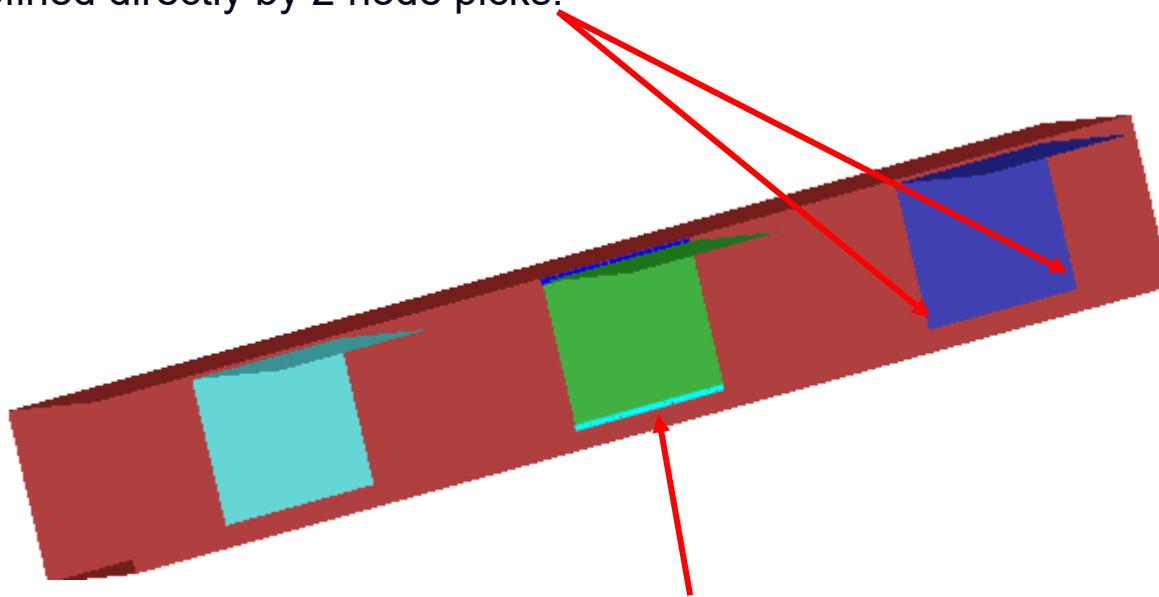
- Or by selection of 1 or more IGES curves.
- The IGES curves may exist in another model.
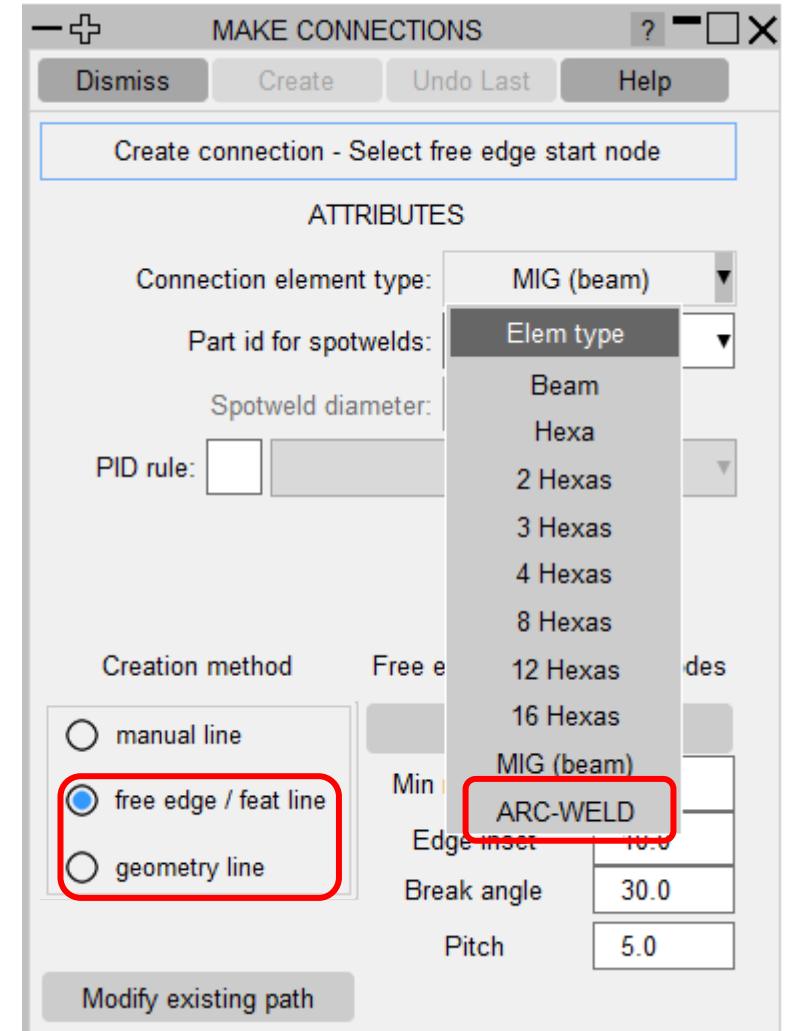
New spotweld line connection: ARC-WELD (contact)

- 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`
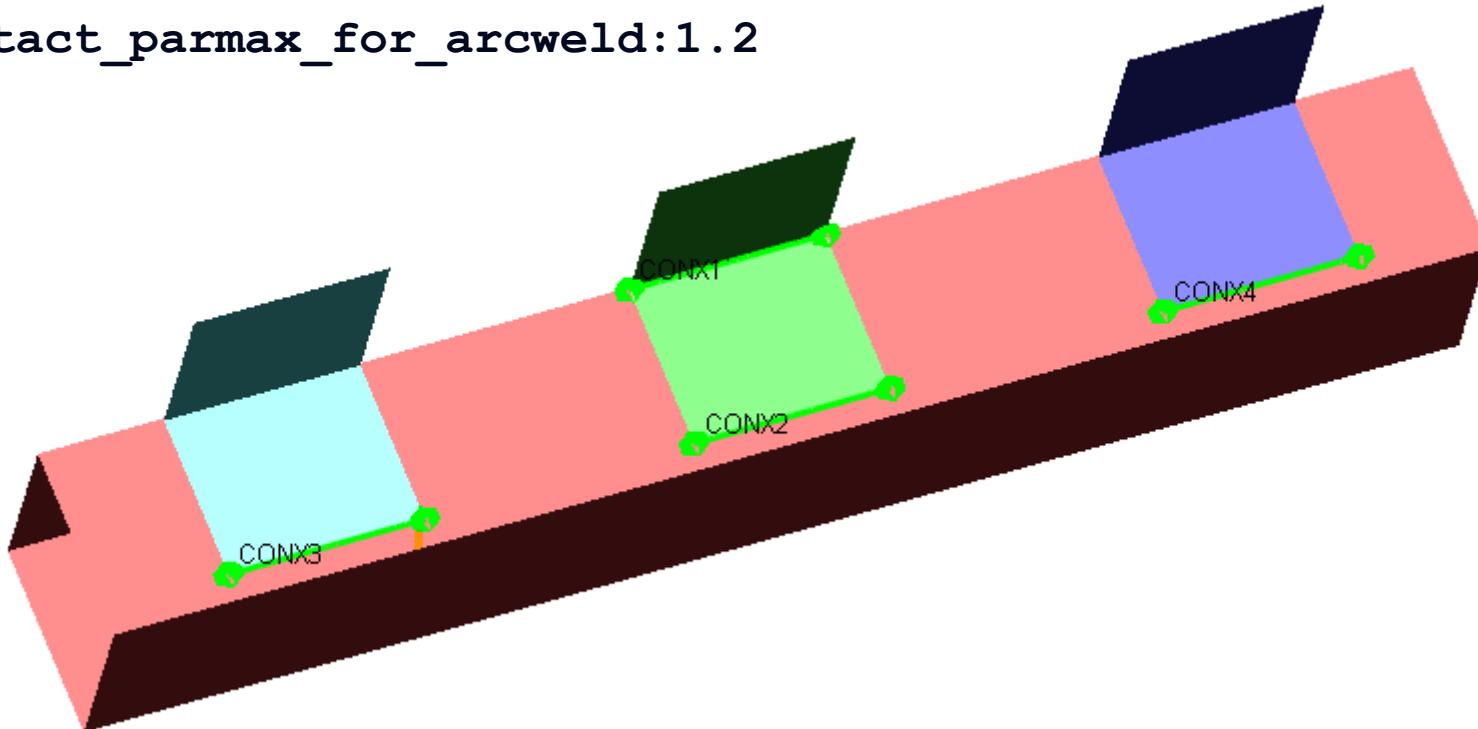
New spotweld line connection: ARC-WELD (contact)

- 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.
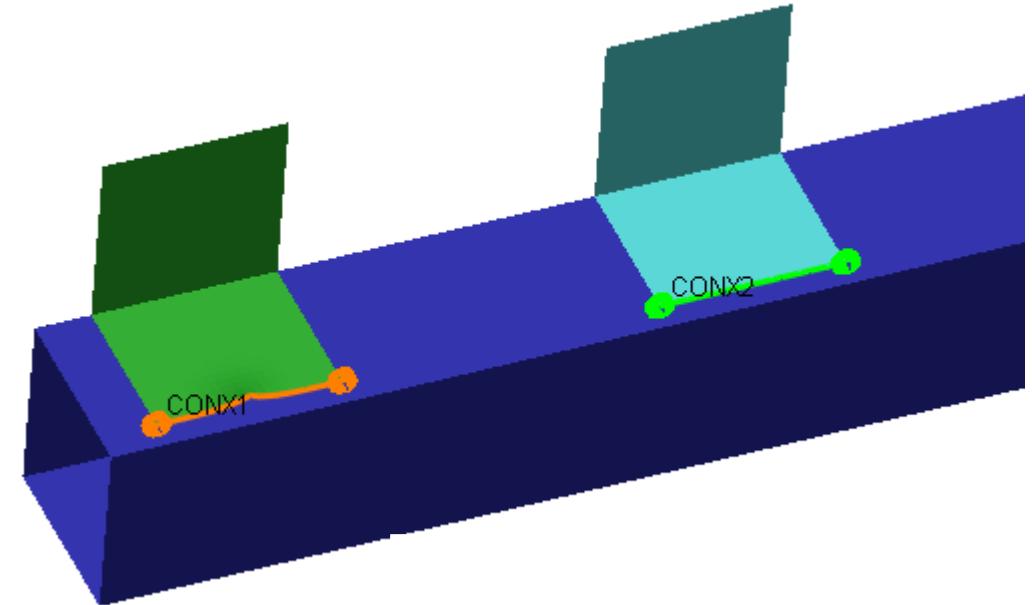
‡ID	Type	Subtype	Status	Error	Details	Contact id
CNX1	LINE	ARC-WELD	Invalid	ARCWELD CONTACT FAIL - failed to tie all tracked node	9/21 nodes untied. sfst=2.00 sfmt=2.00	C1
CNX2	LINE	ARC-WELD	Realized			C2

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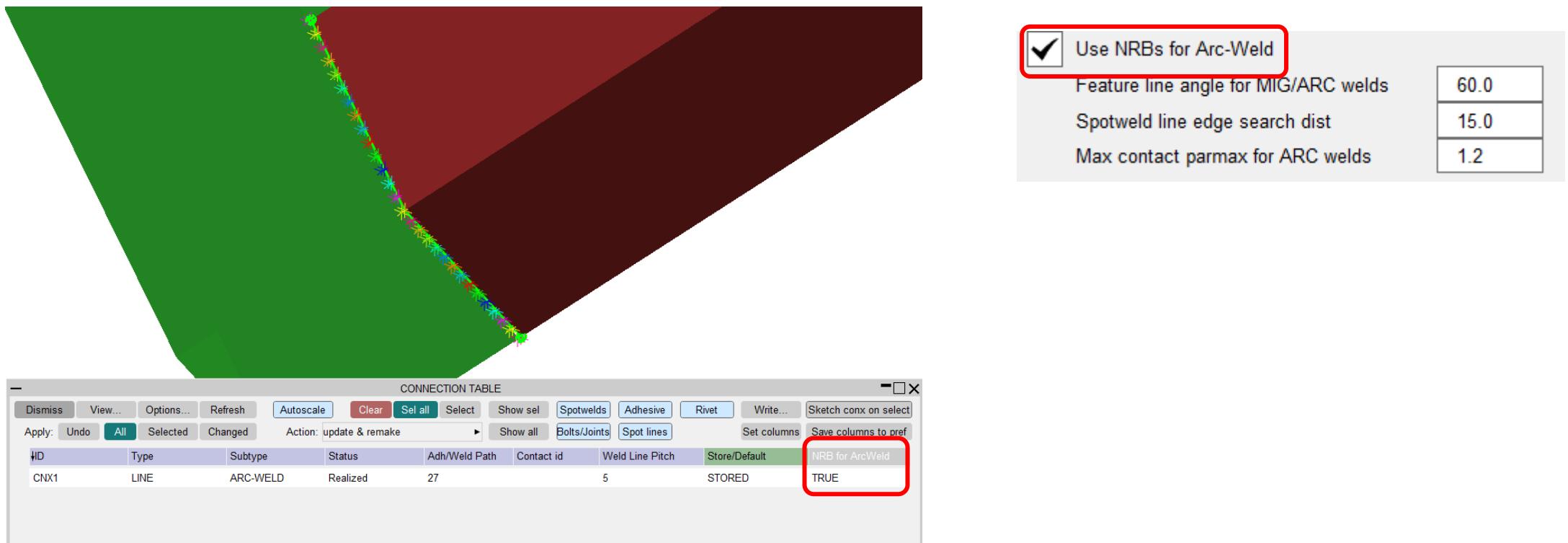
New spotweld line connection: ARC-WELD vs MIG (beam)

- ARC-WELDs can be converted to MIG (beam) via the connection table.
- Existing MIG (beam) welds can also be converted to ARC-WELDs.
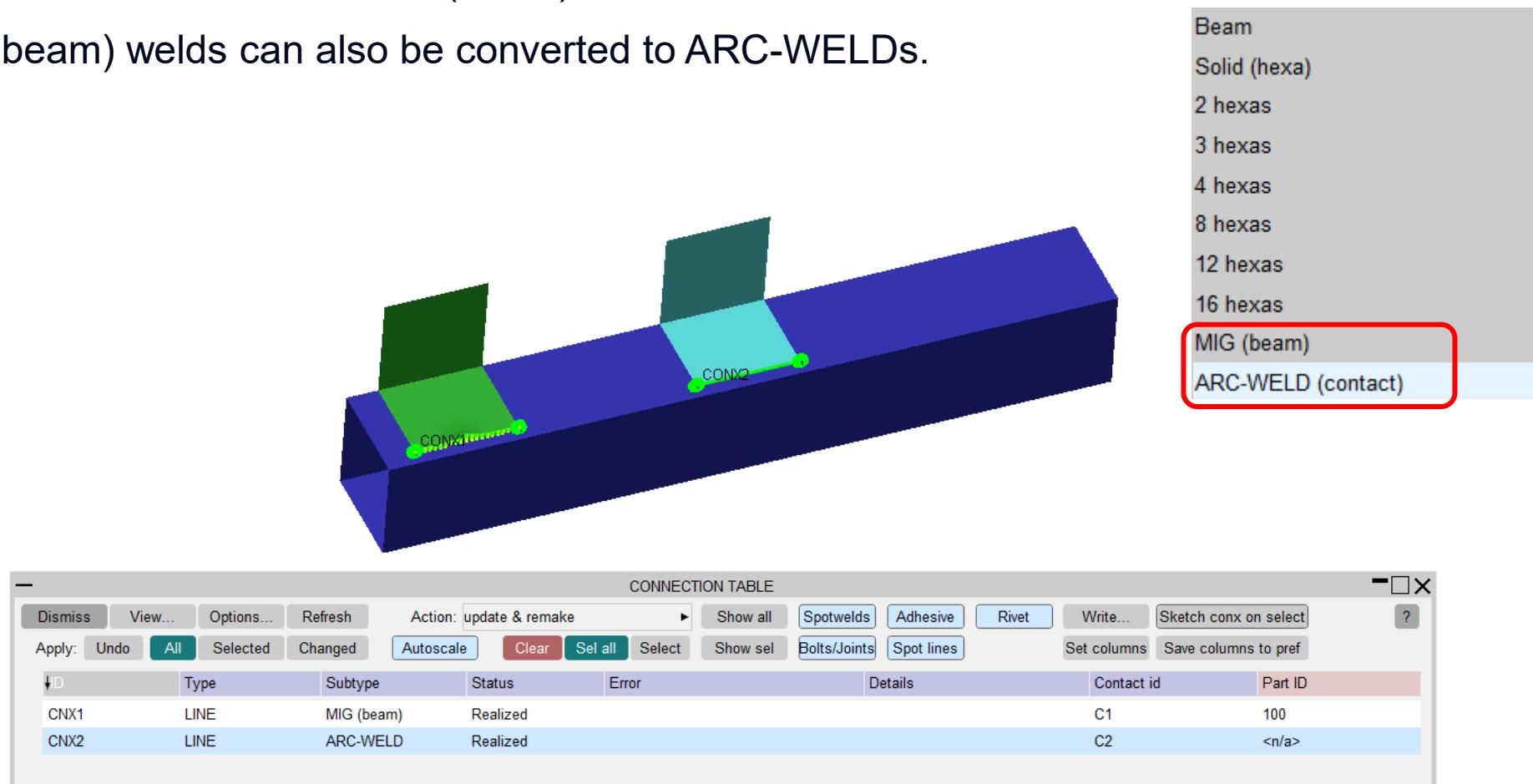
Connections – bolt hole drilling

- 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.
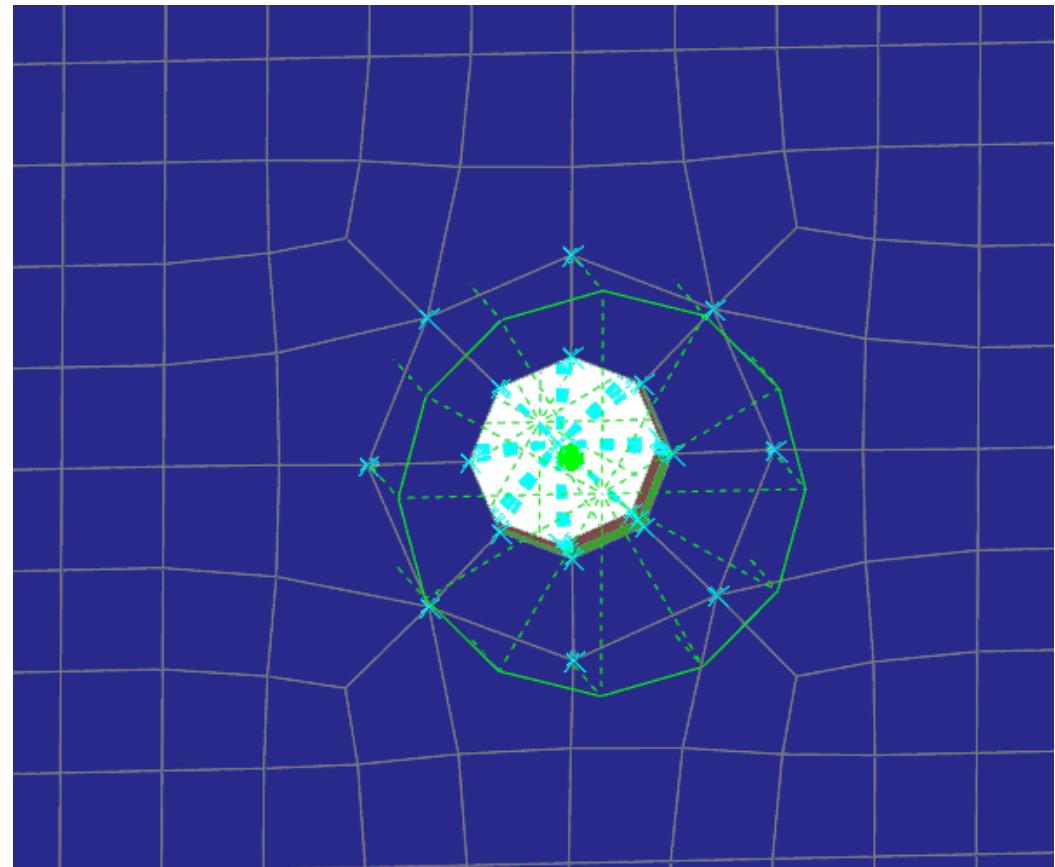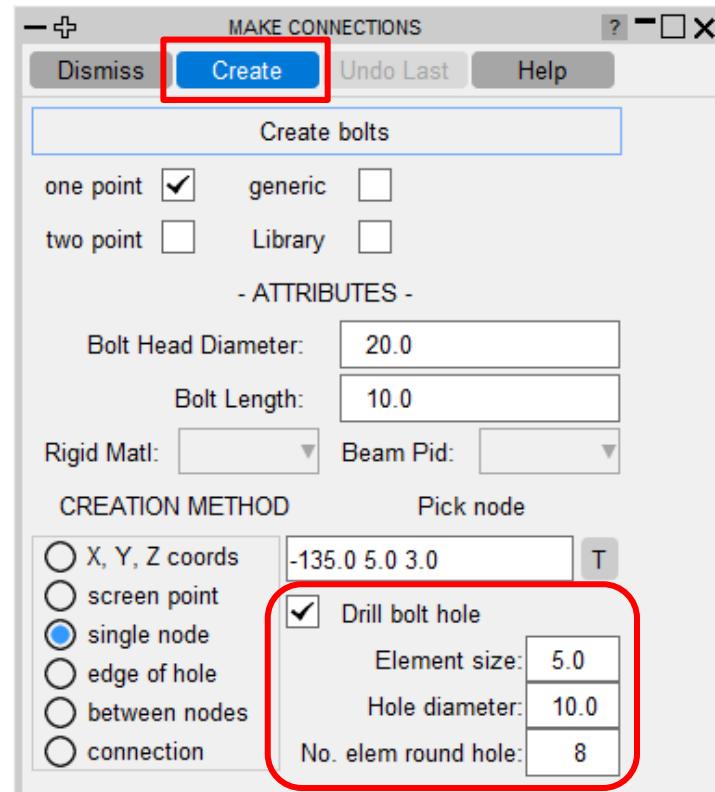
Connections – modular bolt part

- 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.

✓	Simplify merge bolt
✓	NRB bolt attaches to existing nrbs
✓	NRB bolts may use SET_COLLECT
✓	Modular bolts get unique deformable parts
	Modular bolts form SET_GEN_ADD contact

Oasys ∴ LS-DYNA Environment
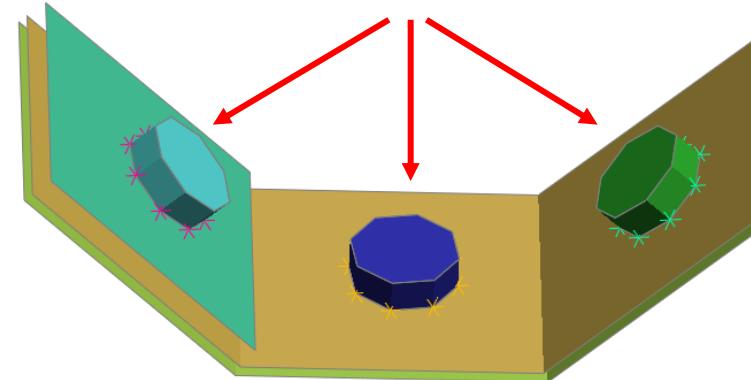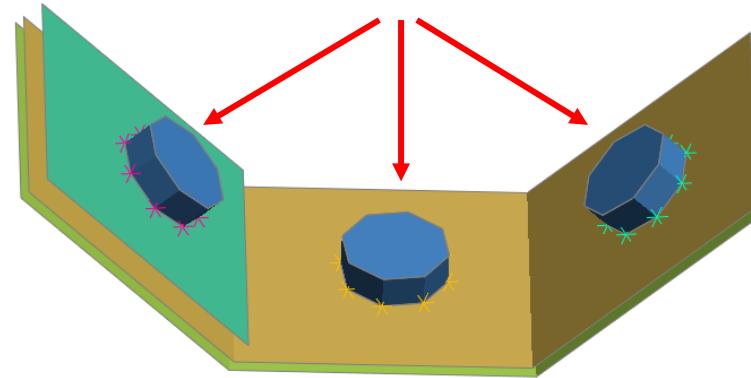
Connections – modular bolt contact

- The new feature described here applies when working with connection bolt modules containing ***SET_SEGMENT_GENERAL** which typically will use ***DEFINE_CONTACT_VOLUME**.
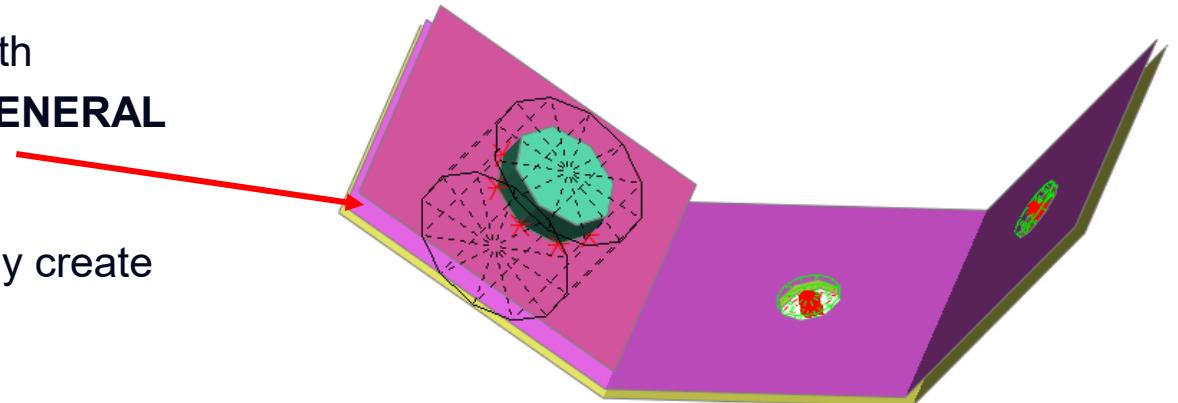
- The following new bolt connection option will automatically create contacts:

✓	NRB bolts may use SET_COLLECT
✓	Modular bolts get unique deformable parts
✓	Modular bolts form SET_GEN_ADD contact
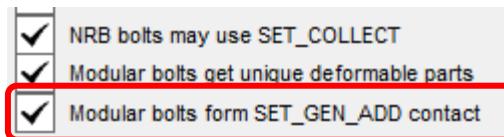
- On bolt creation ***CONTACT** is created with ***SET_SEGMENT_ADD** containing multiple ***SET_SEGMENT_GENERAL**.

- All bolts of same module will have the ***CONTACT**.

- The ***SET_SEGMENT_ADD** title references the module name.

MODIFY SET_SEGMENT M1/S_SG5

Update Reset All Check Sketch Only
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
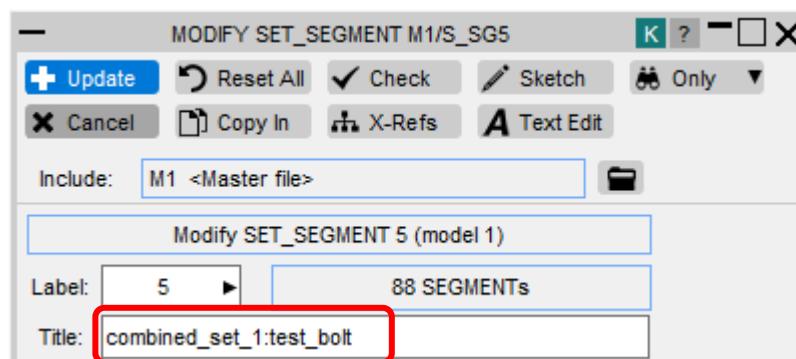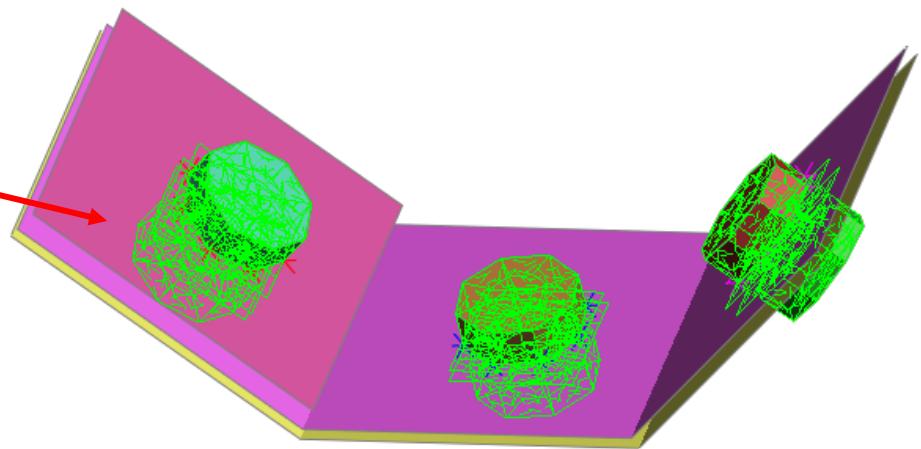
HAZ – options for increased number of elements per ring

- 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.
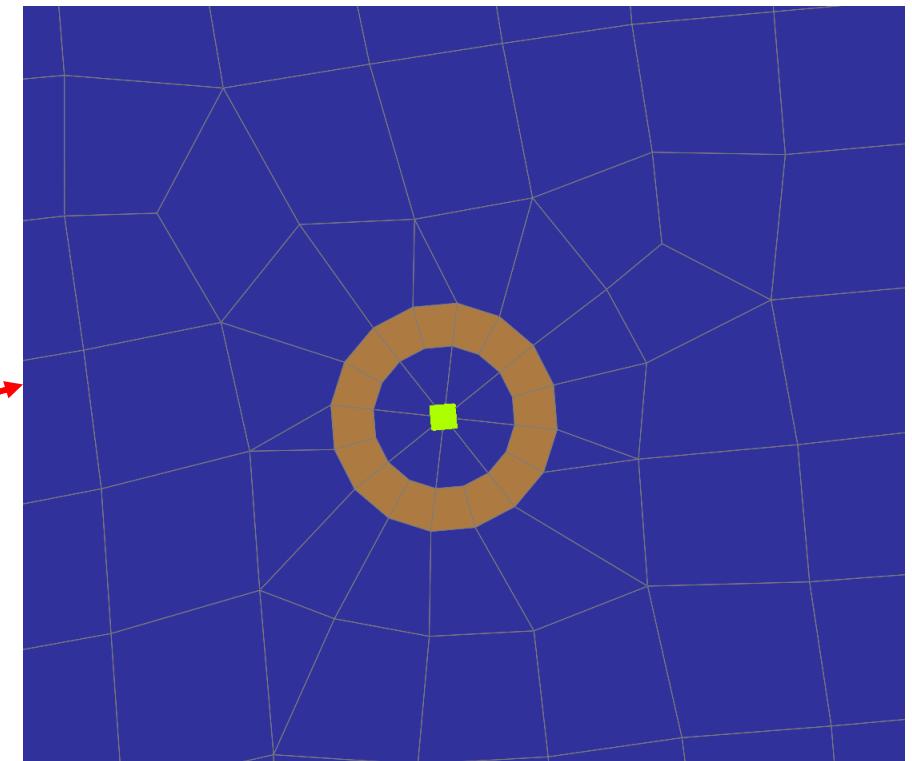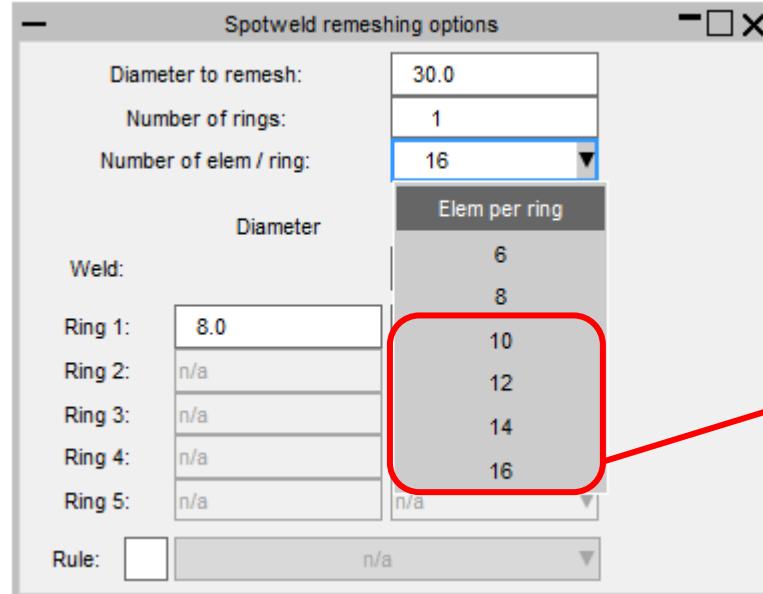
Solid spotwelds – new nugget types

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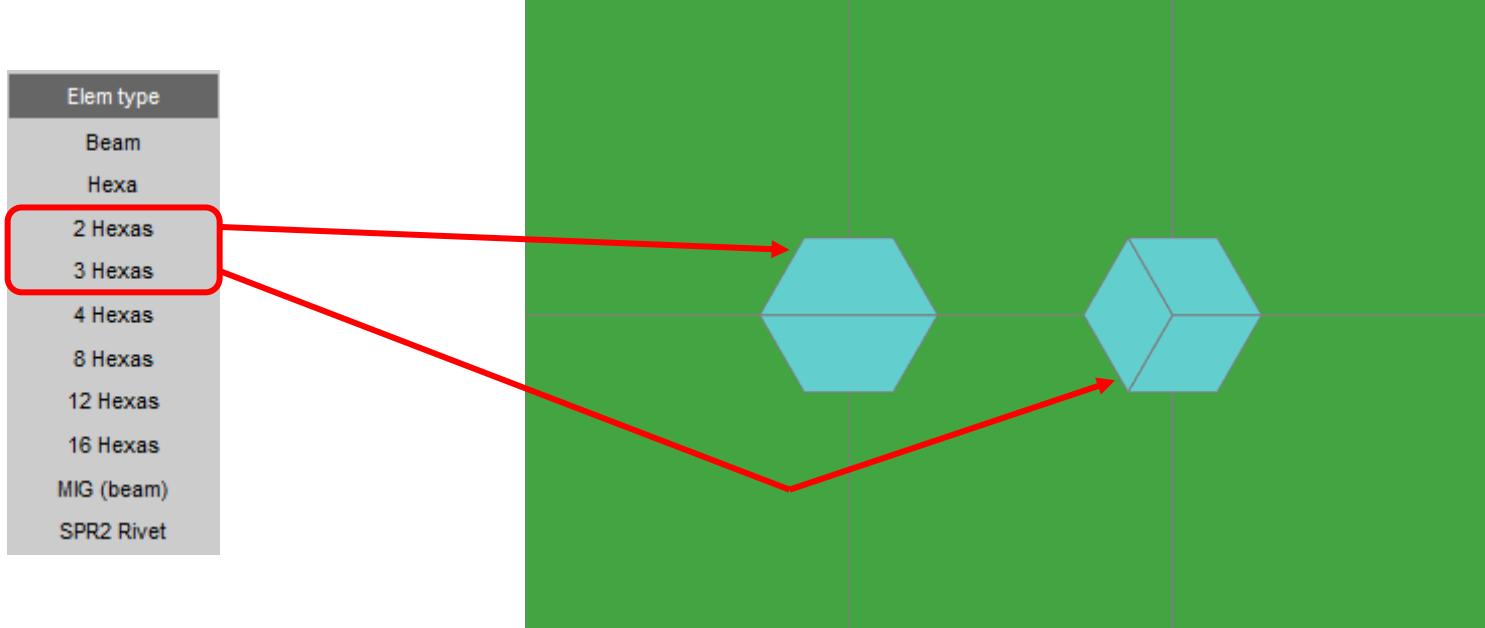
Connections – spotweld_remake_auto_remove_layer

- 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.

Oasys LS-DYNA Environment
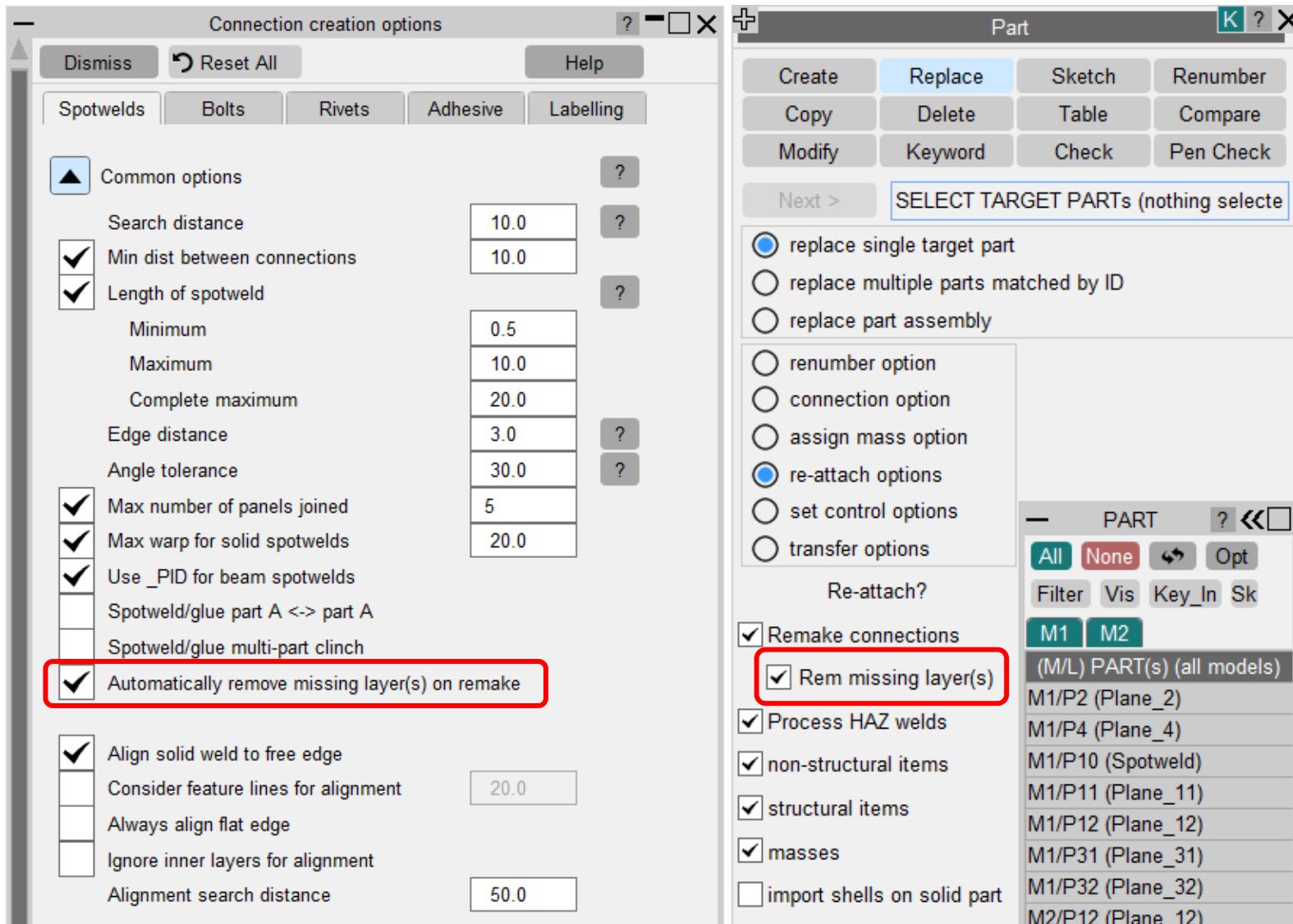
Connections Compare – Filter options

- 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
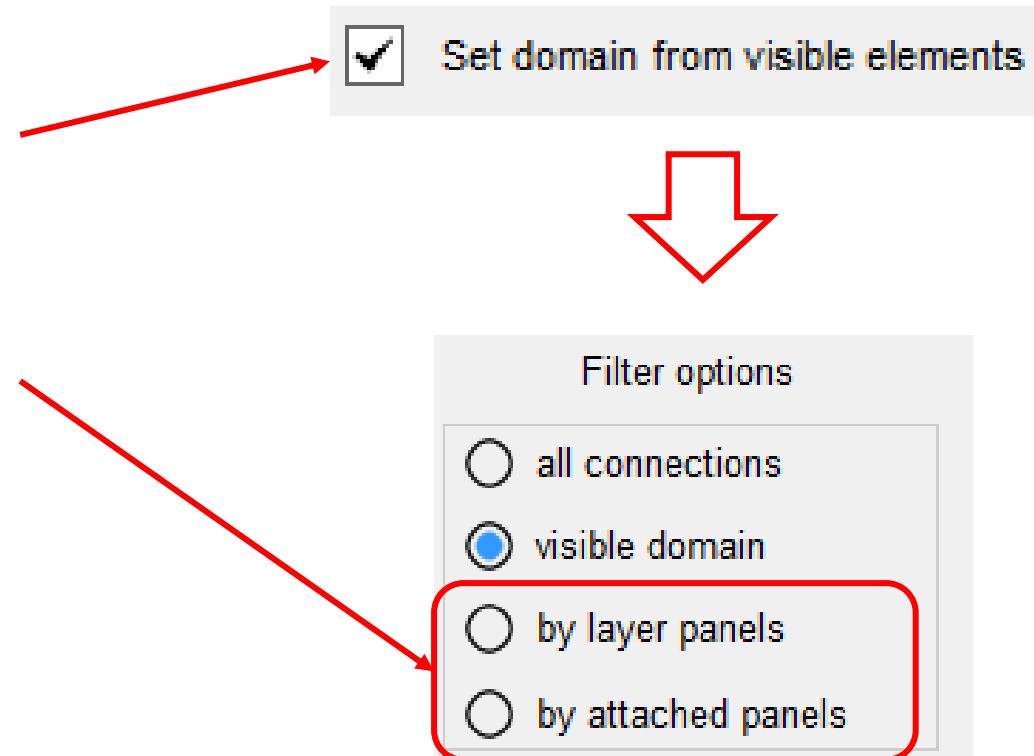
Connections – UI improvements

- 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.

Load Path Tool Enhancements

Auto-create cross sections

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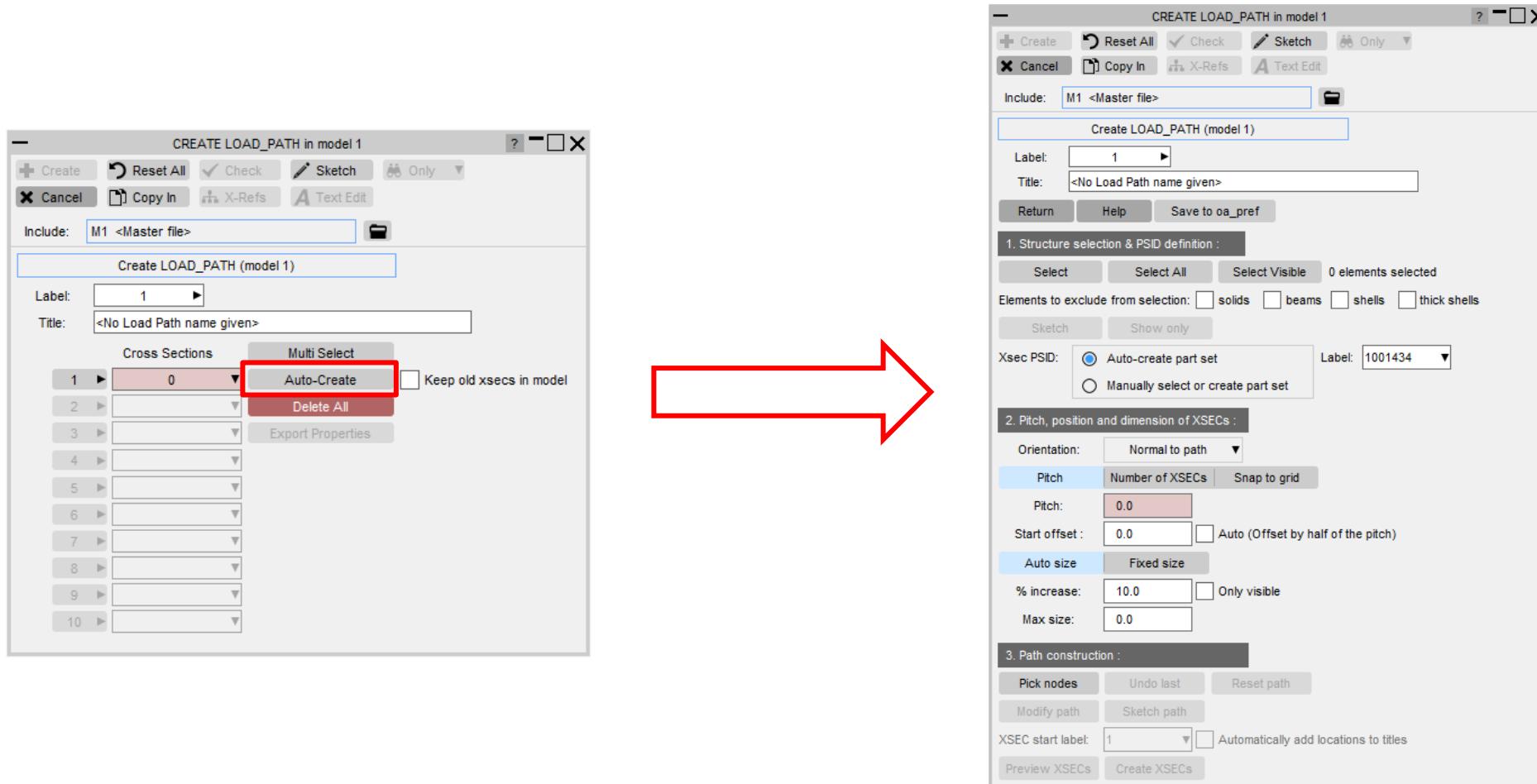
Auto-create cross sections

- The process involves the following steps:

1. Select the desired structure and the PSID to be referenced by the ***DATABASE_CROSS_SECTION**s.
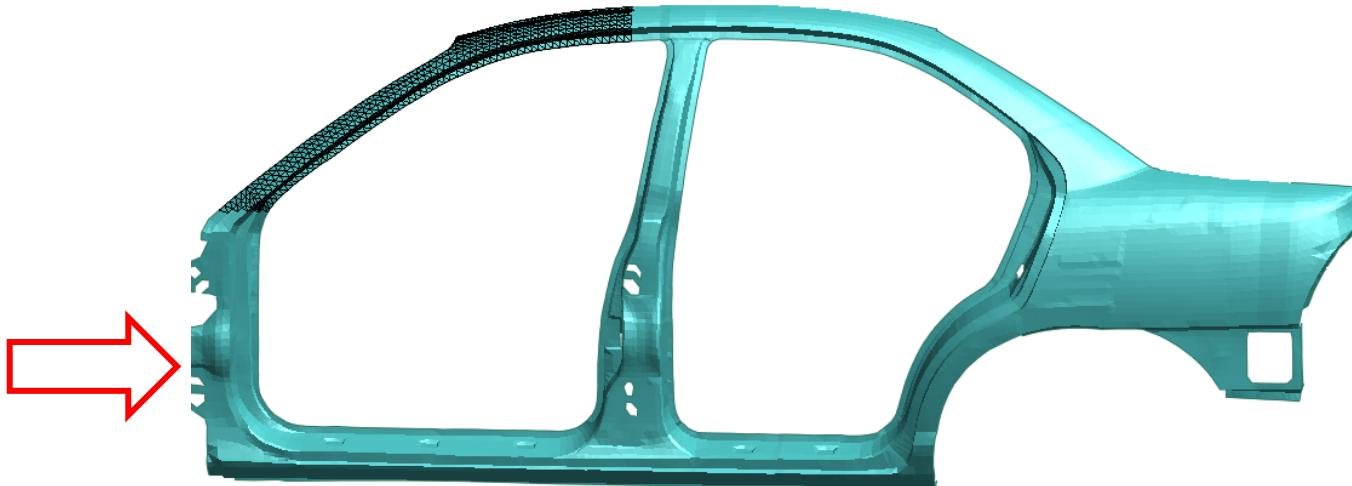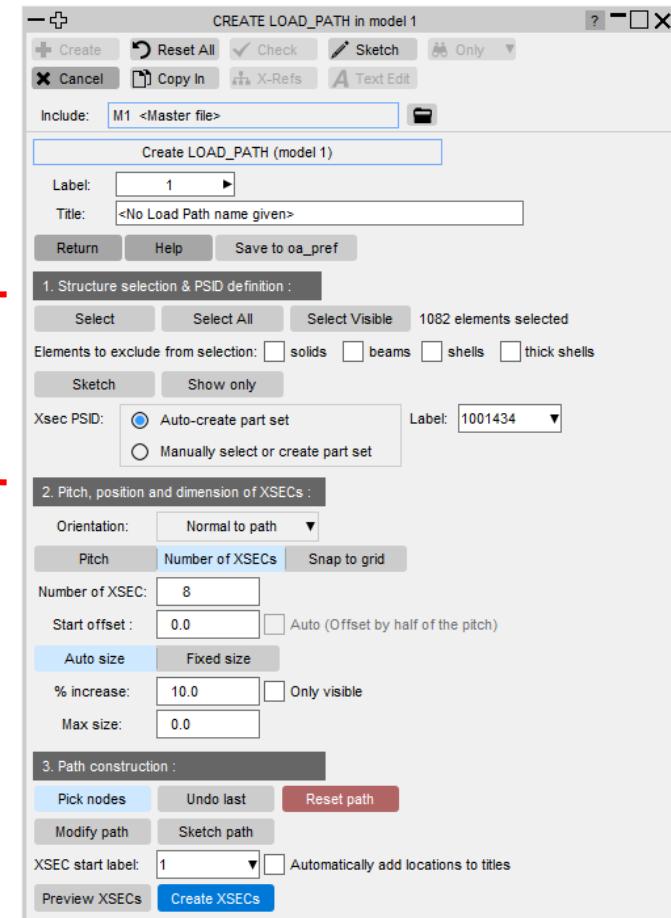
Auto-create cross sections

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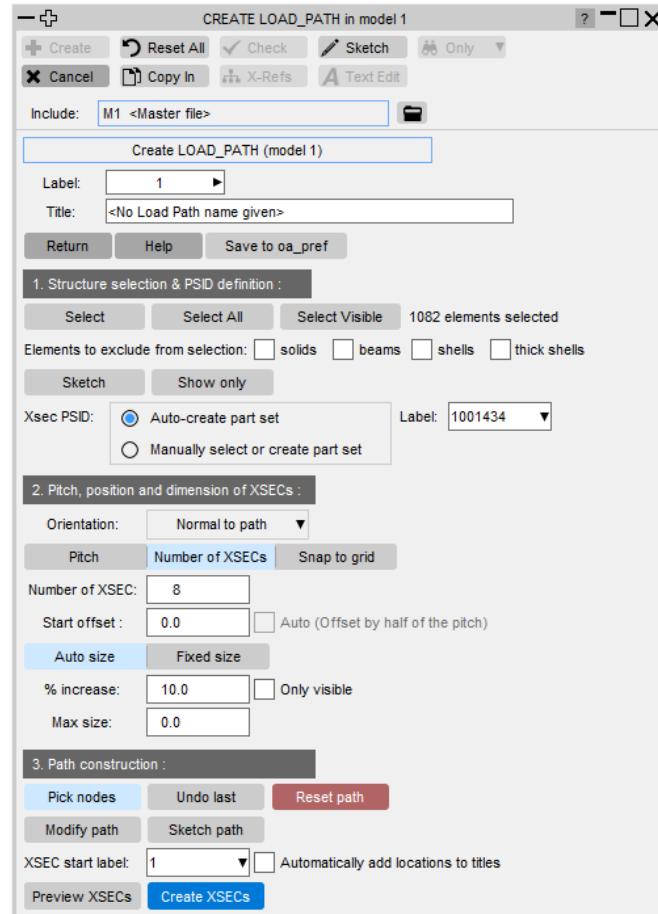
Auto-create cross sections

3. Define a path at the desired structure by picking at least 2 nodes.
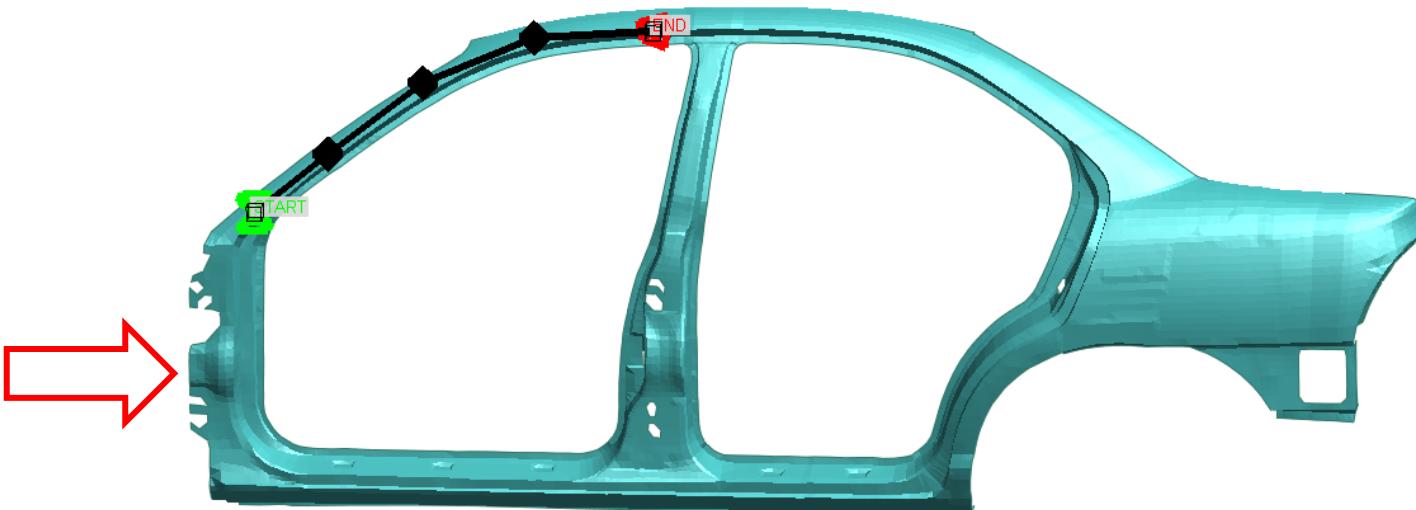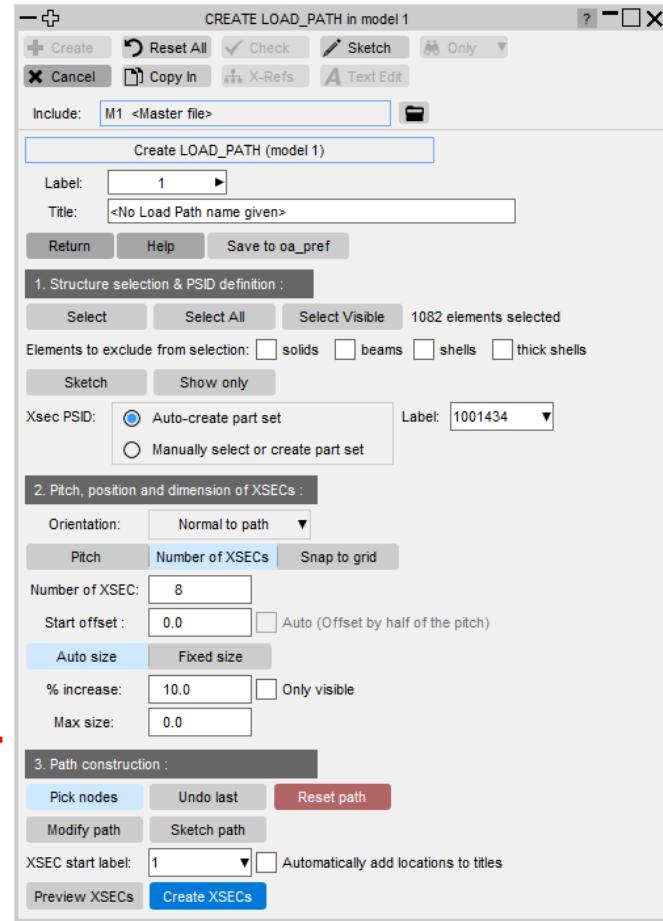
Auto-create cross sections

- The ***DATABASE_CROSS_SECTION**s can then be created by PRIMER and the load path list in the main panel is automatically populated.
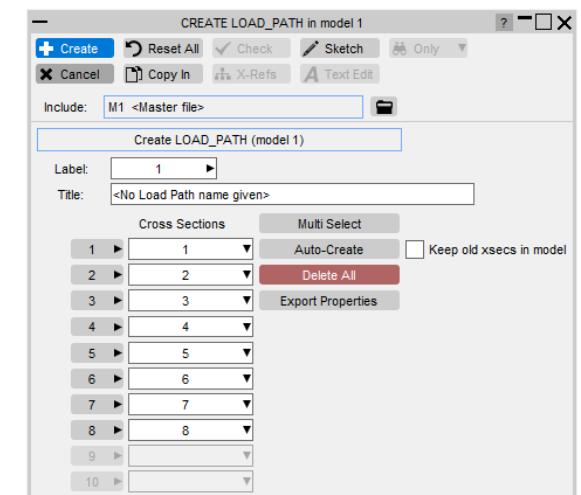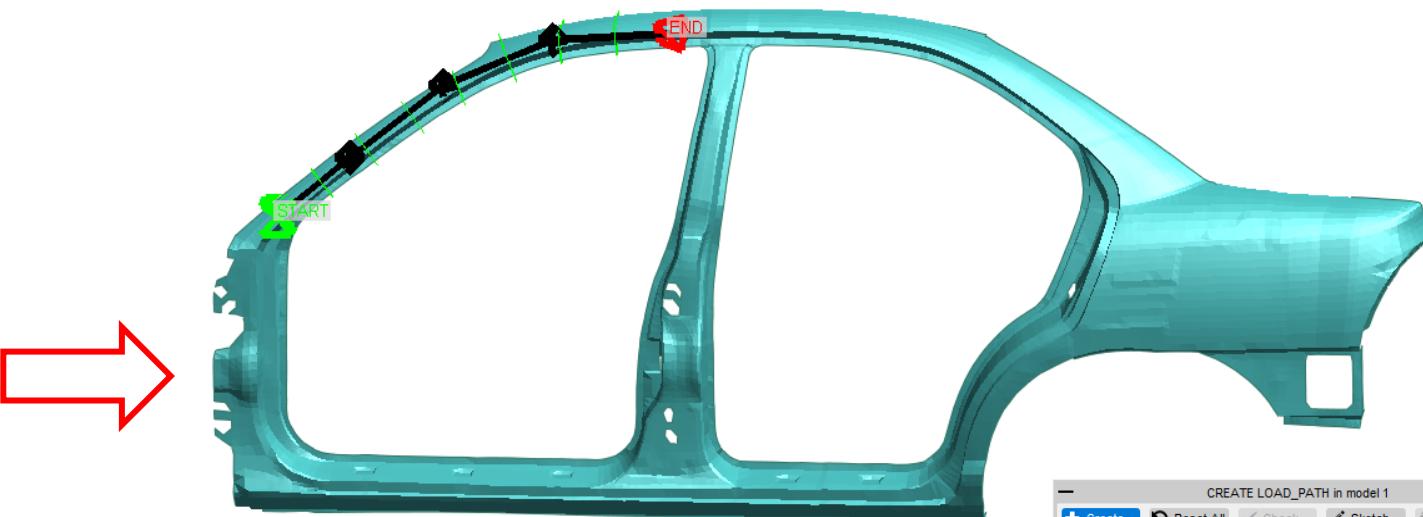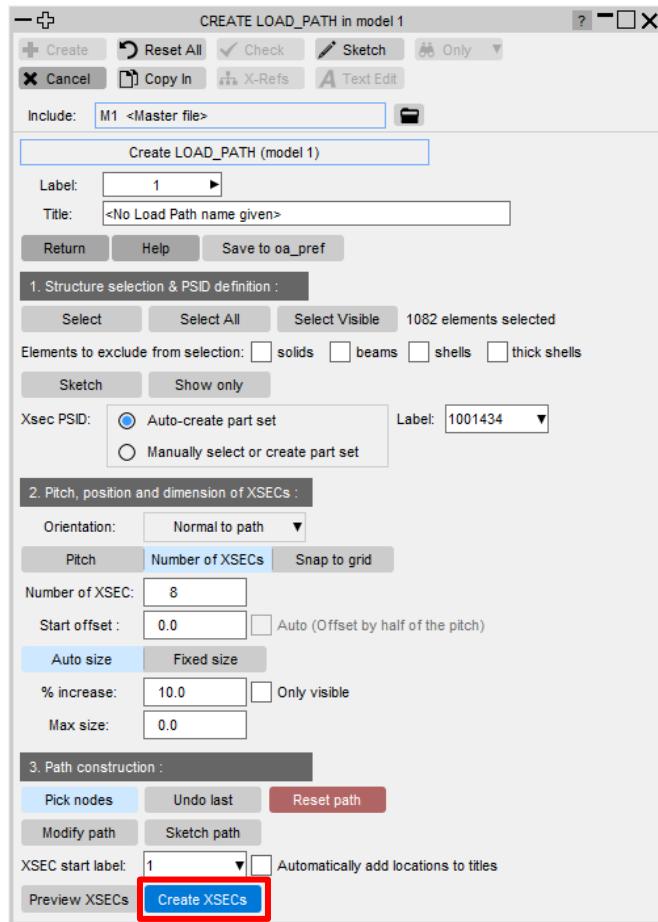
Saving 'auto-create' settings as preferences

- 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.
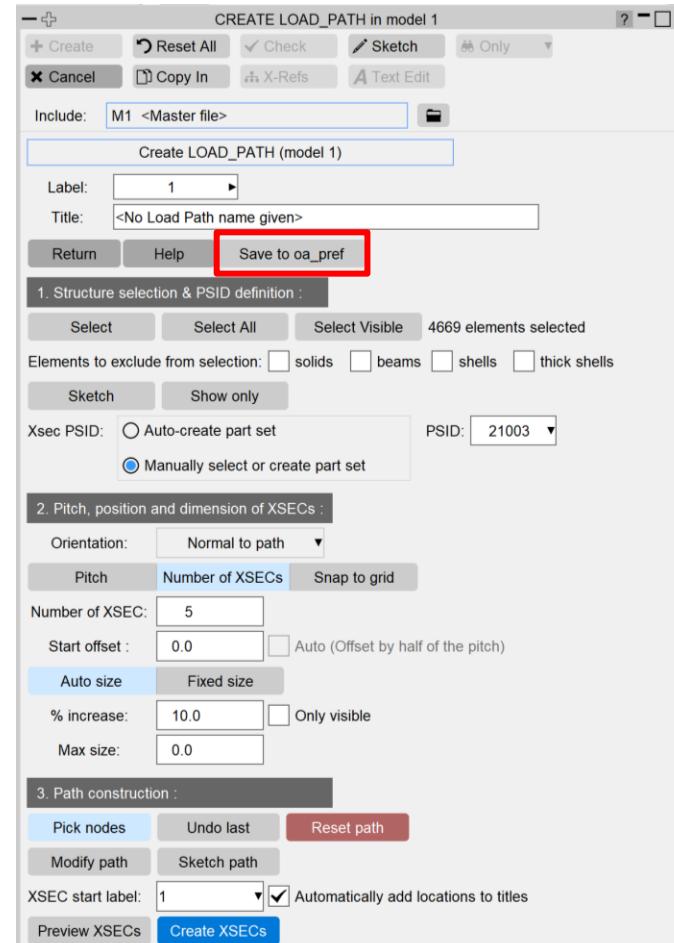
Exporting properties to CSV

- 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.
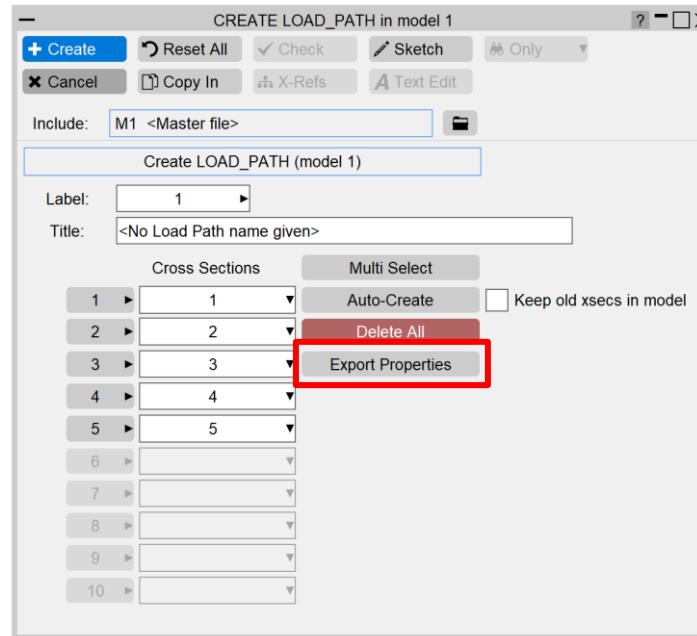
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Cut section properties for load path 1 in model 1																		
2	Cross secti title		psid	xct	yct	zct	xch	ych	zch	xhev	yhev	zhev	lenl	lenm	Area	Xc	Yc	Xc_g	Yc_g
3	1 X=3162		1001434	3.16E+03	7.01E+02	9.32E+02	3.09E+03	6.78E+02	9.95E+02	3.16E+03	7.01E+02	2.93E+03	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

Oasys LS-DYNA Environment

Human-Safe Design

Loadcases

Oasys LS-DYNA Environment

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.
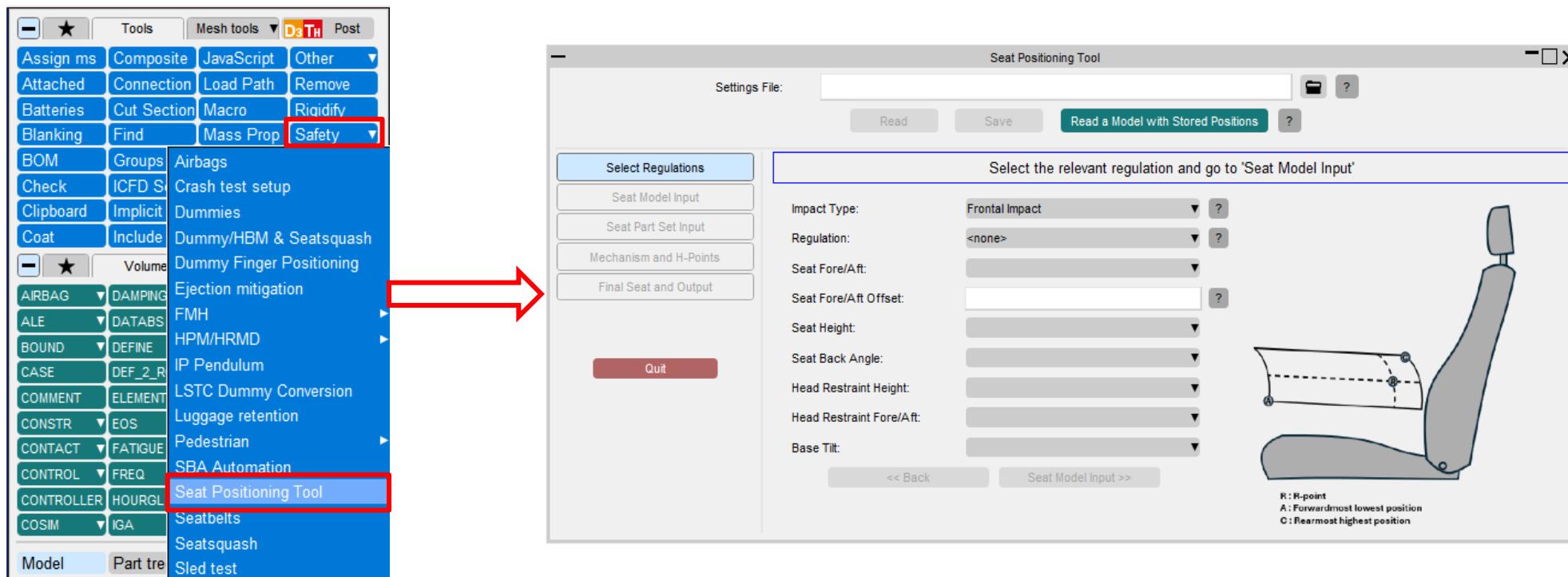
Seat Positioning Tool

- 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)	

Oasys ❖ LS-DYNA Environment

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.
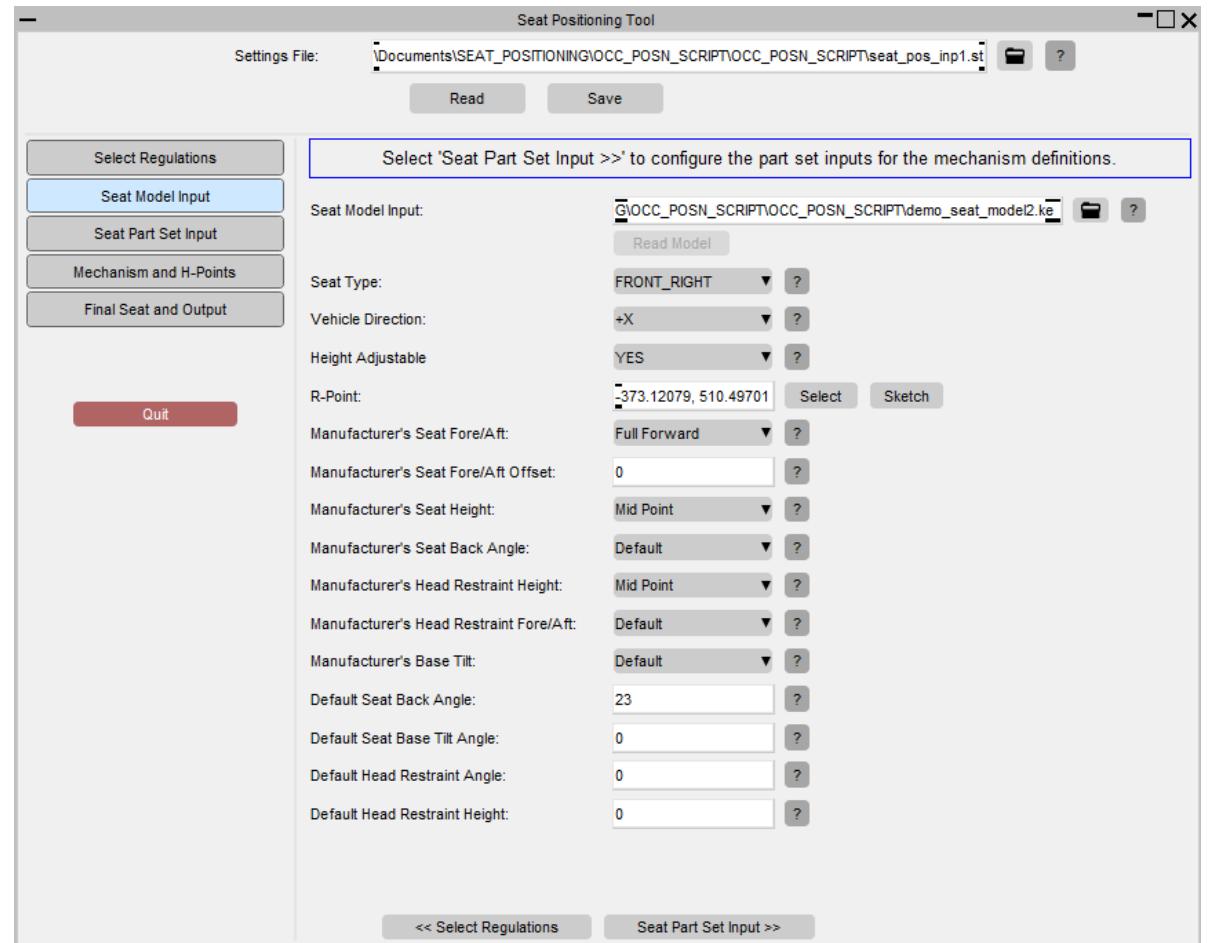
Seat Positioning Tool

- 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.
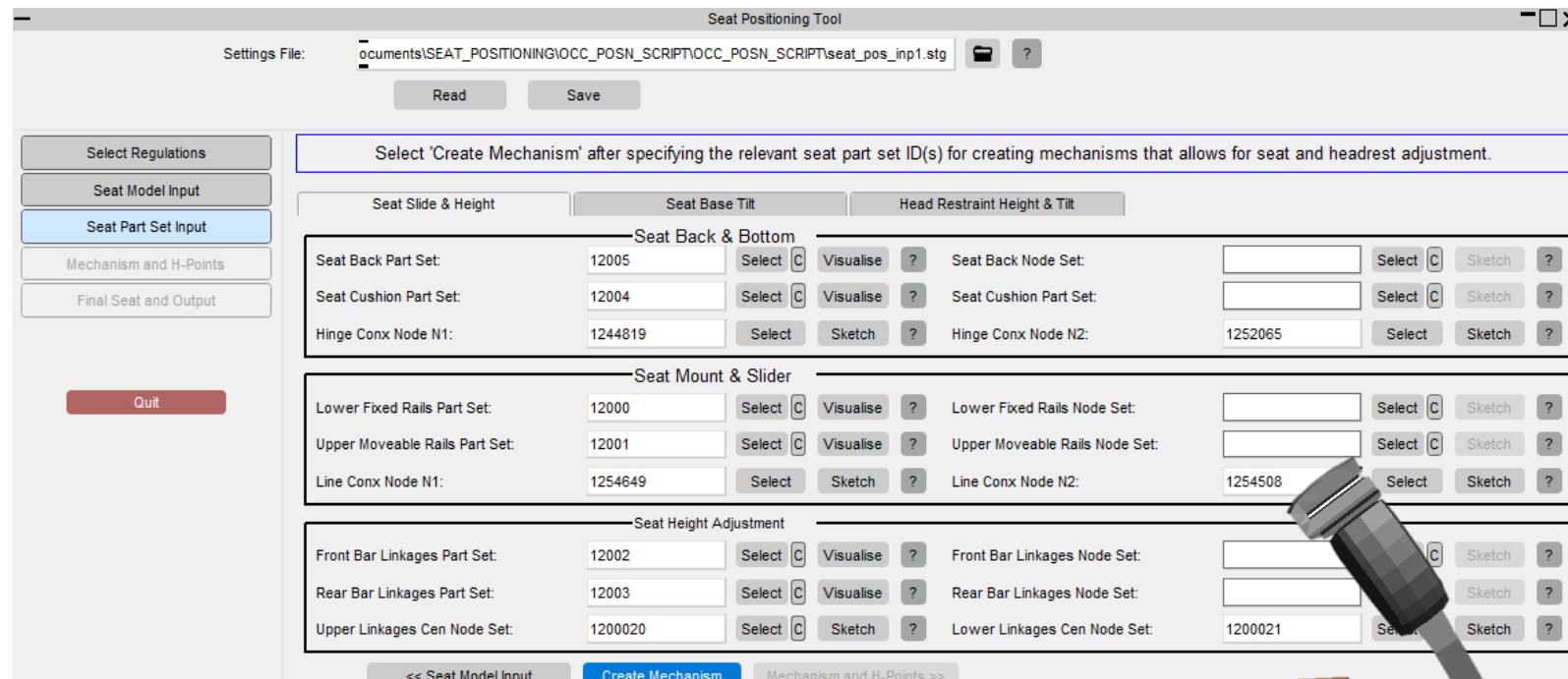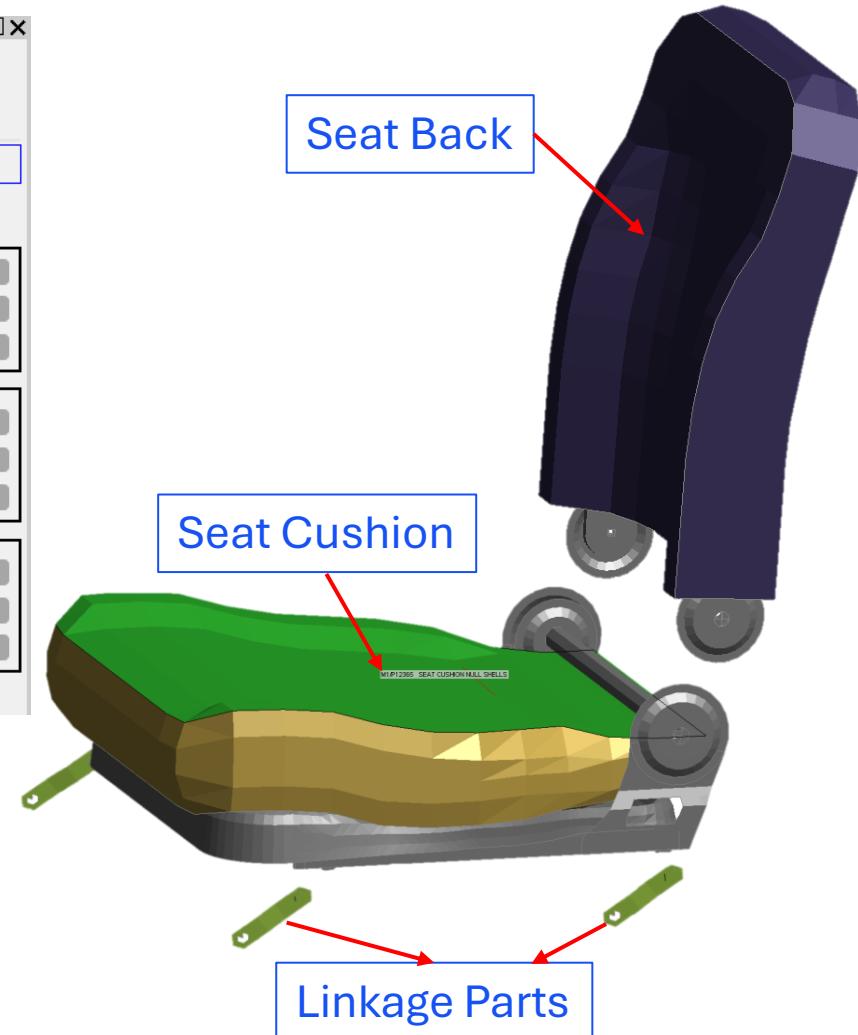
Seat Positioning Tool

- 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.
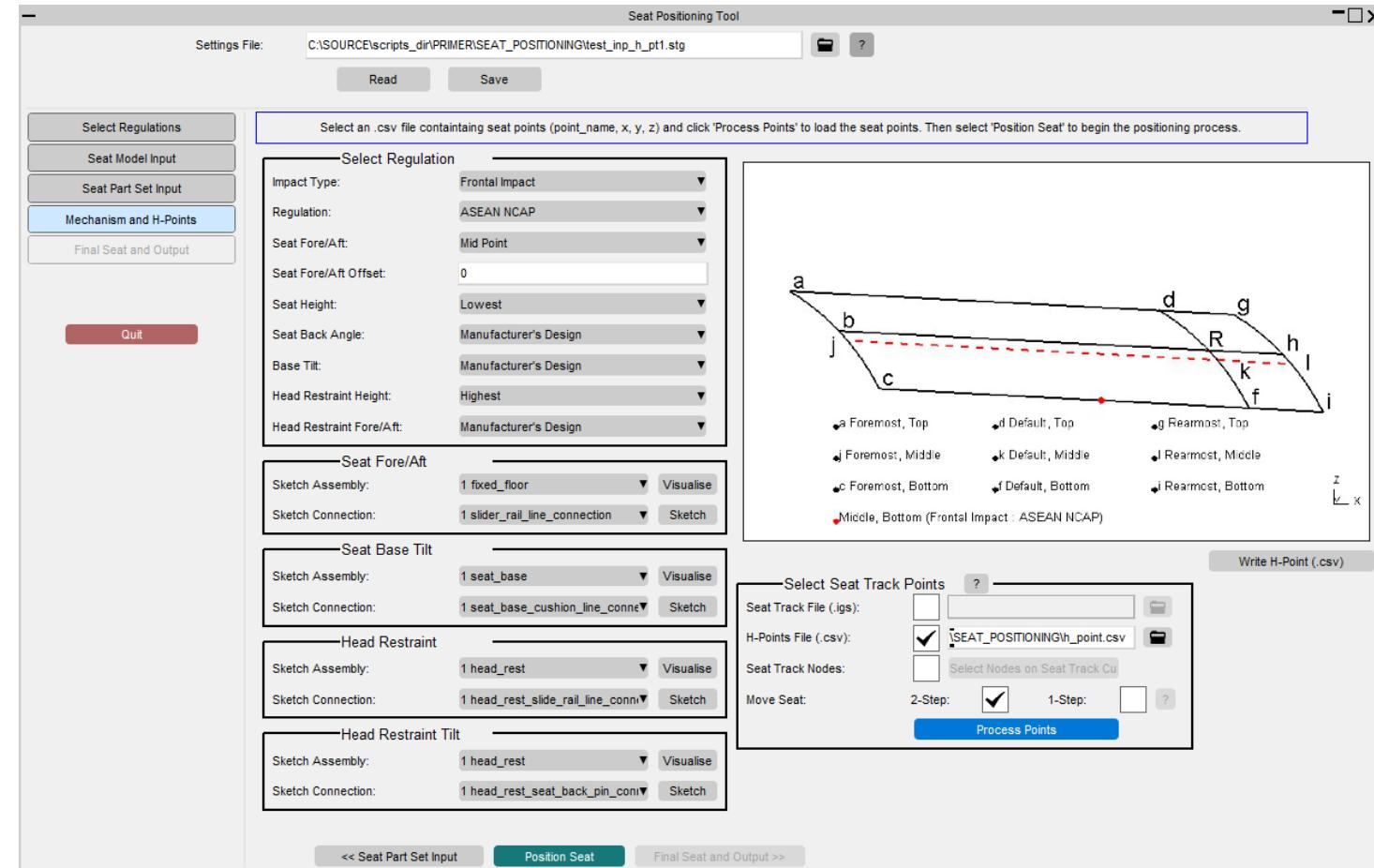
Seat Positioning Tool

- 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).
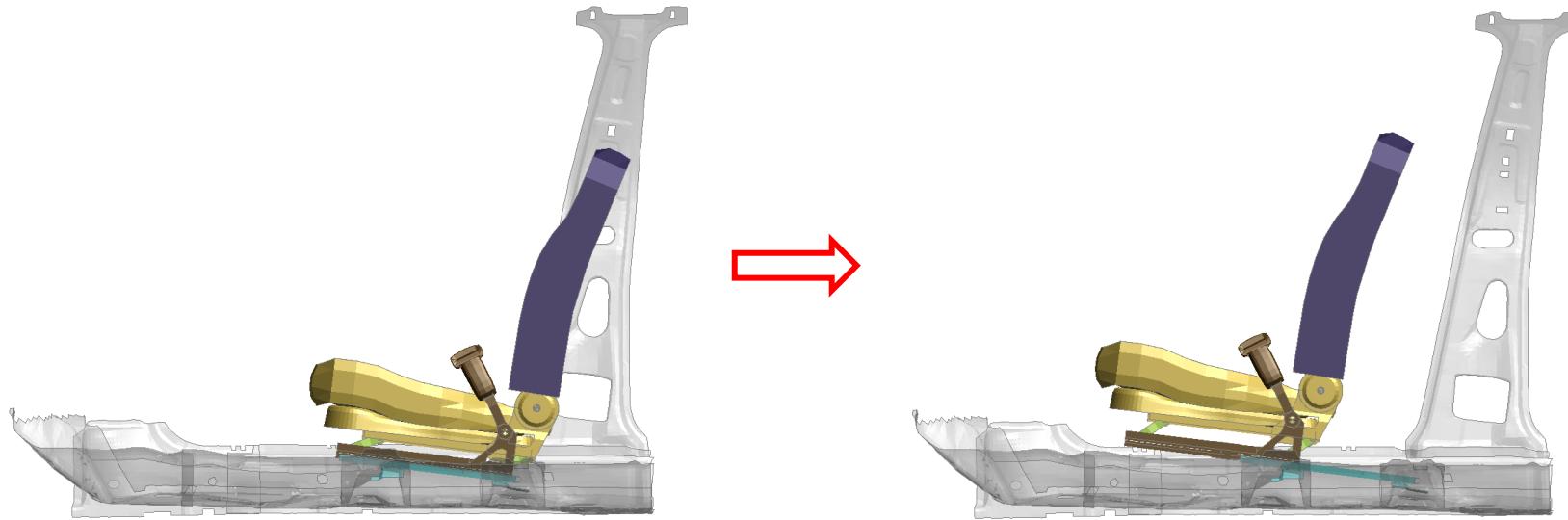
Default Position (R-point)

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.

Oasys LS-DYNA Environment

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.
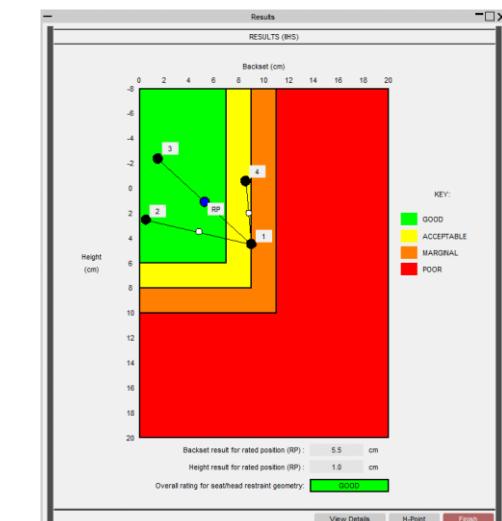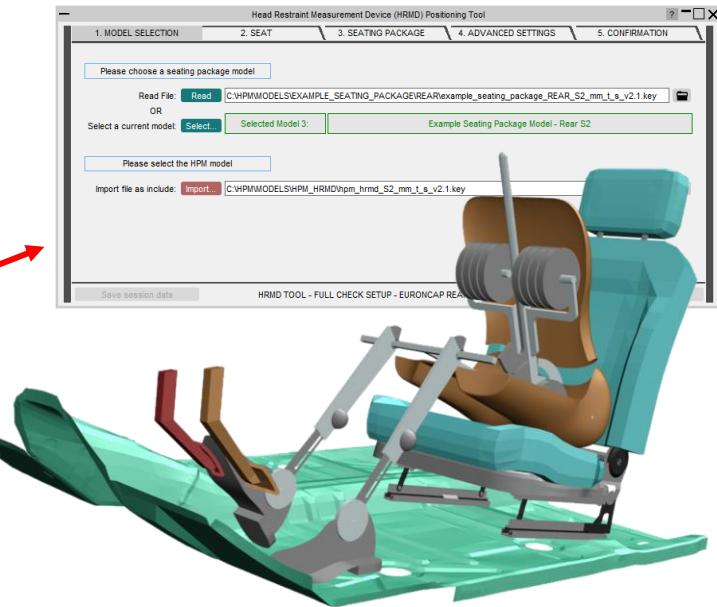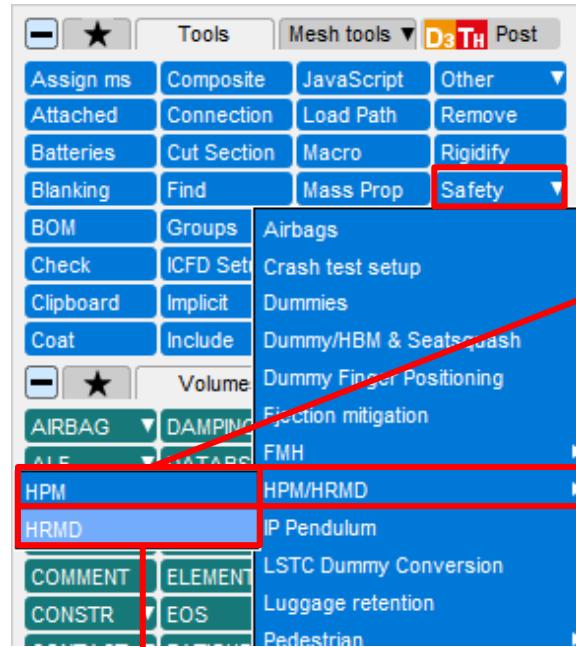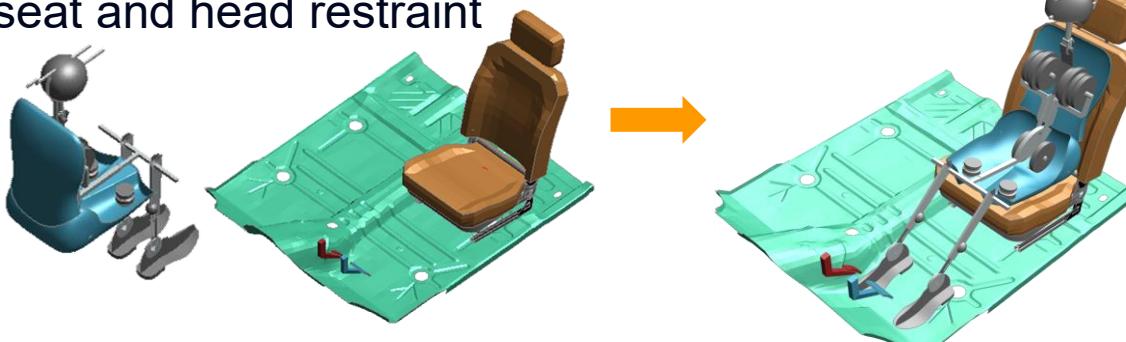
HPM/HRMD Tools

- 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.
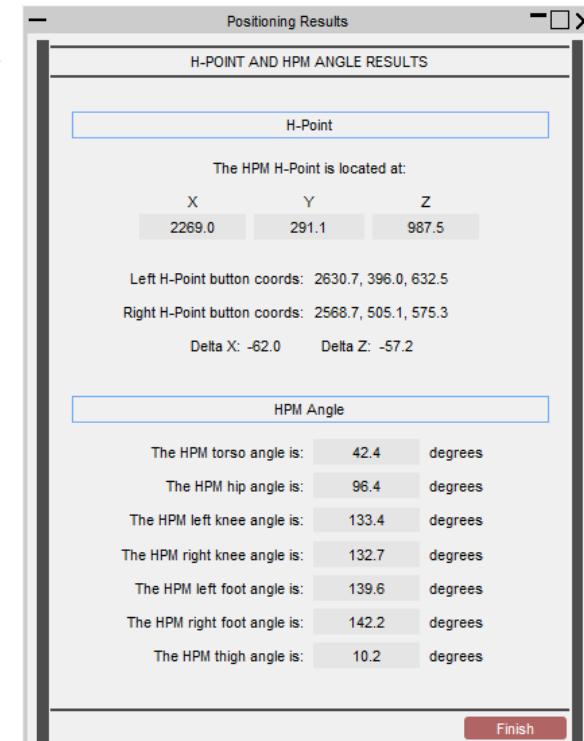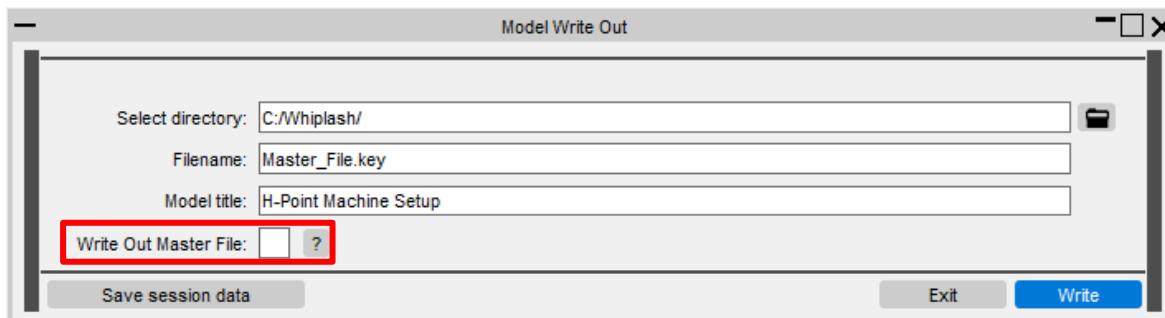
IP Pendulum – Enhancements

- 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.
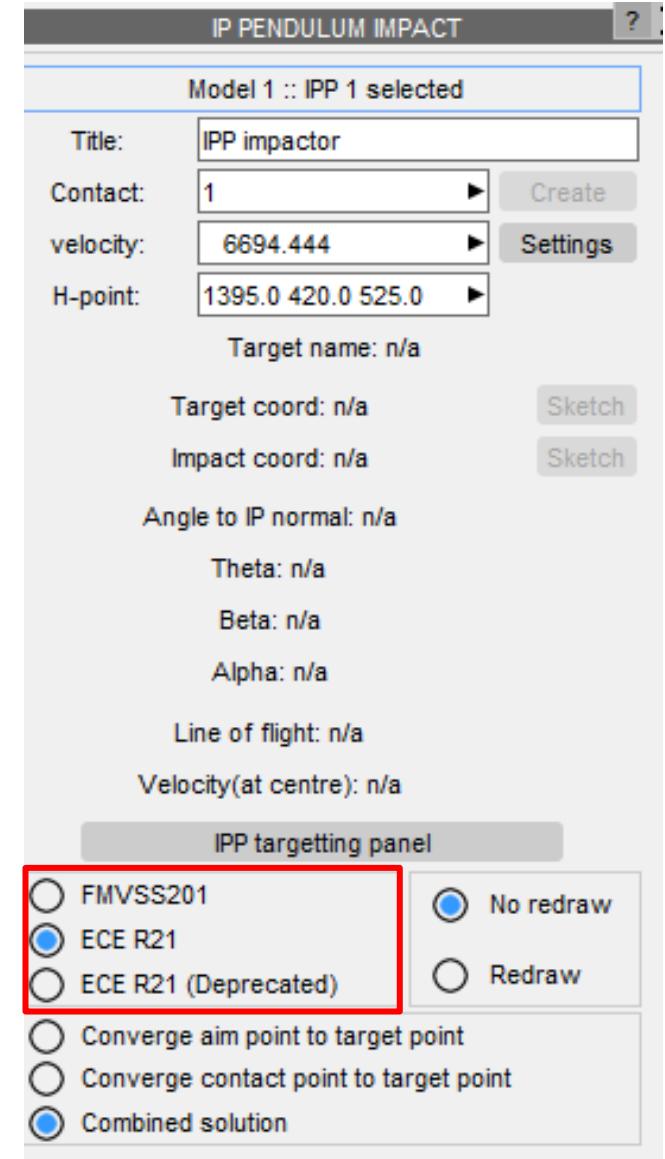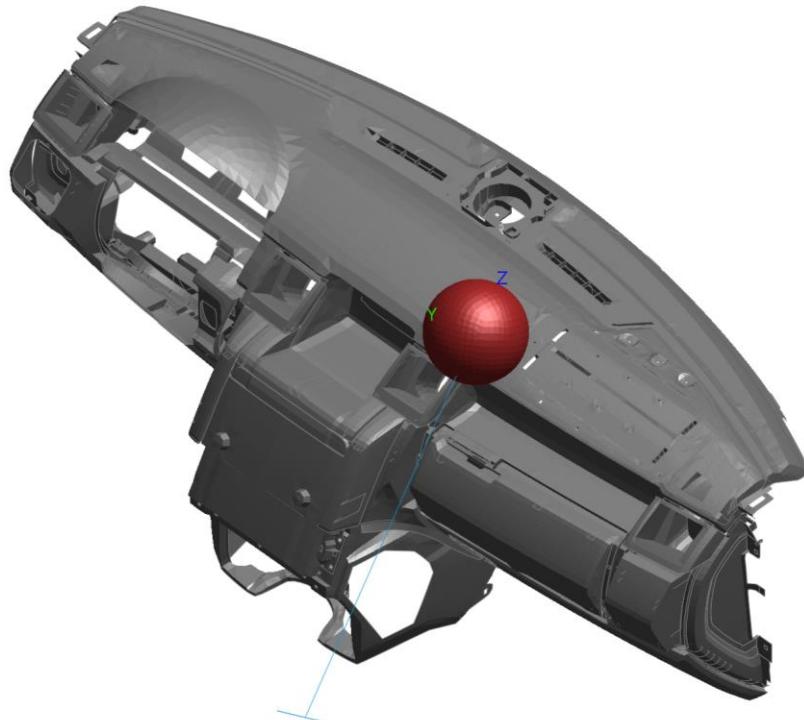
IP Pendulum – Enhancements

- 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.

Default settings for ECE R21

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.

Oasys LS-DYNA Environment
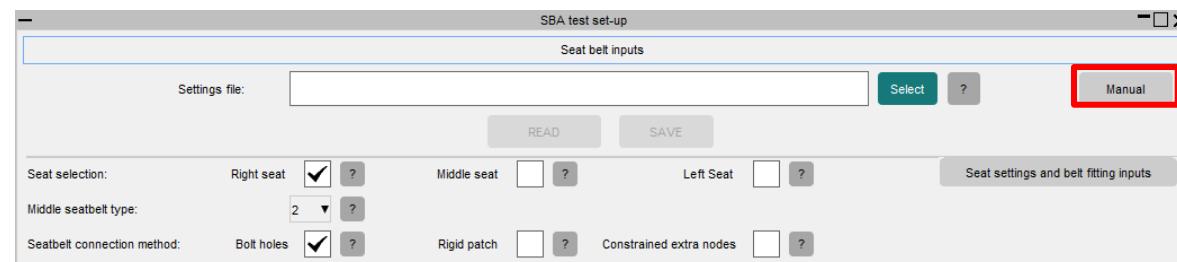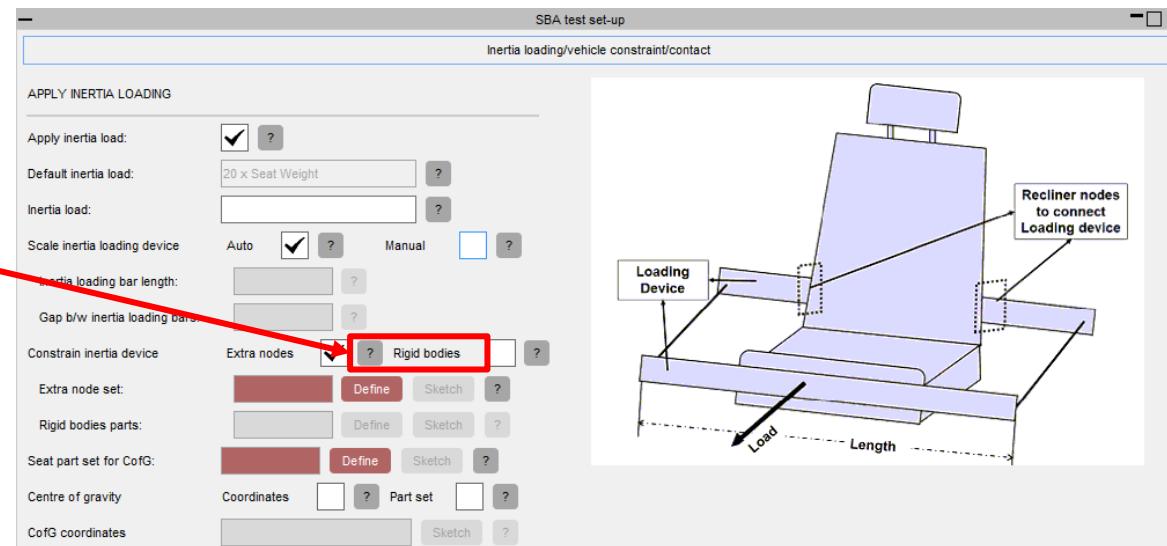
HBM Tools

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.
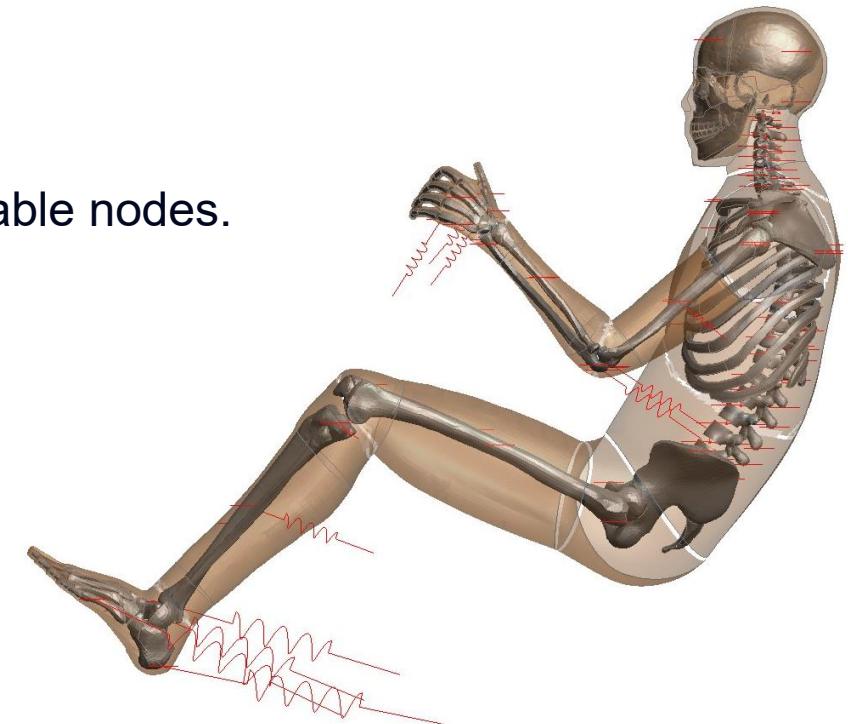
Updates to *ASSEMBLY keyword for Dummies/HBMs

- 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

2

<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

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.
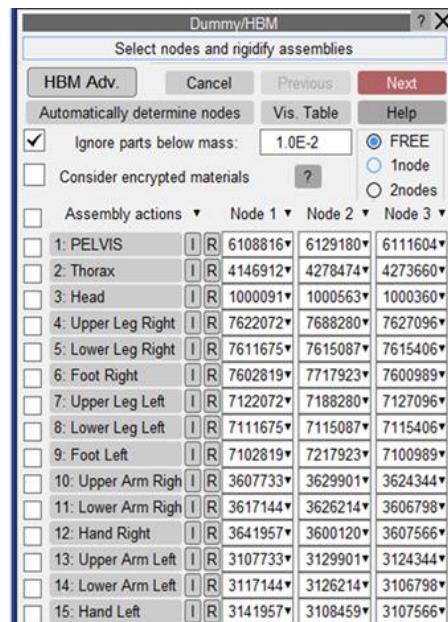
For Dummies/ATDs/HBMs
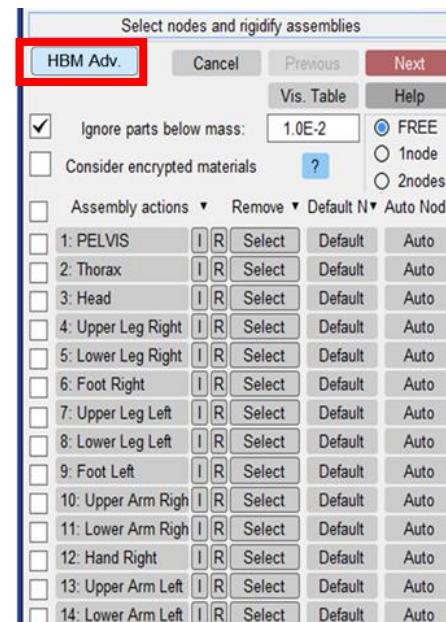
Only for HBMs
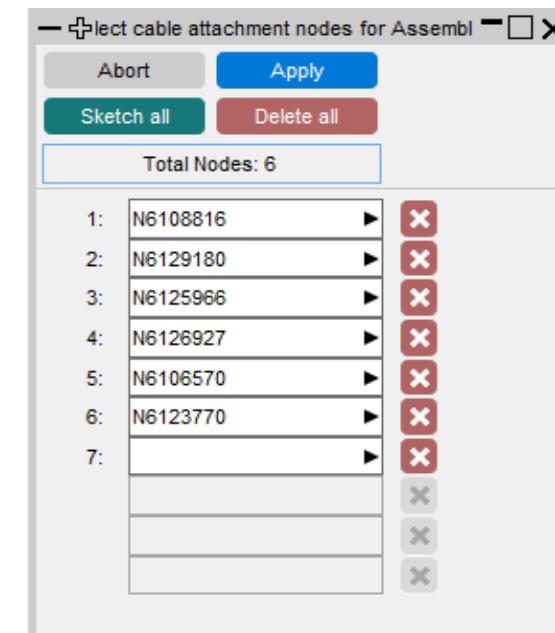
Selection panel and graphics view in PRIMER

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.
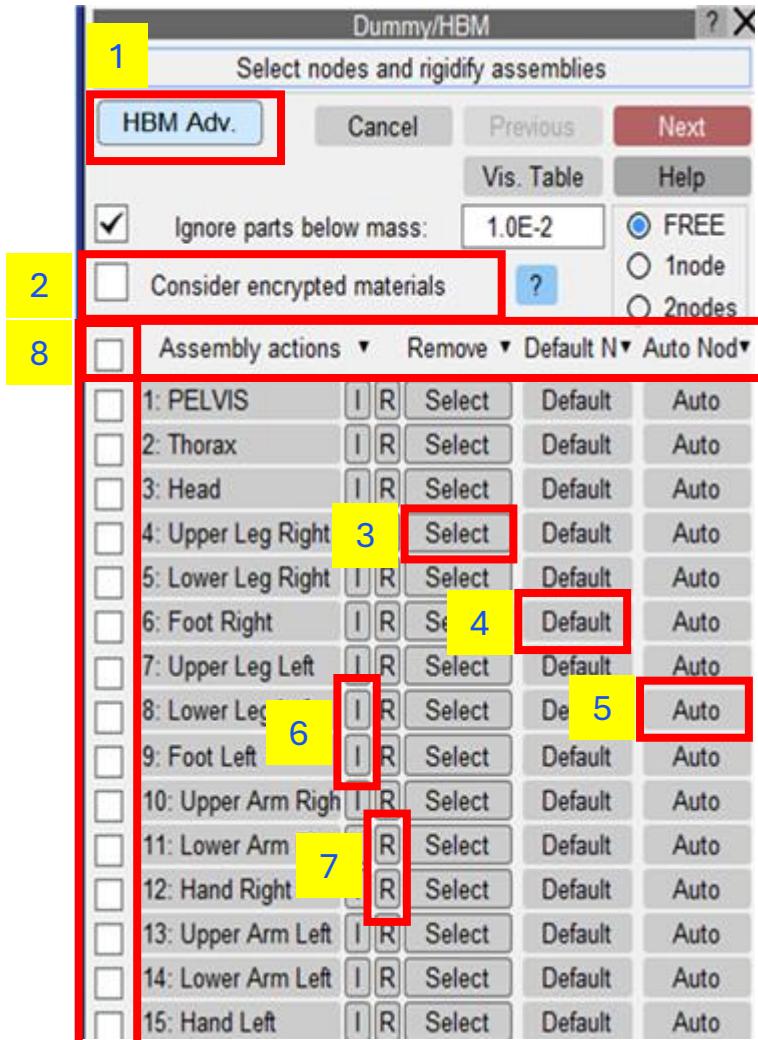
Updates to load curves for Dummy/HBM positioning

- 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.

Oasys :: LS-DYNA Environment
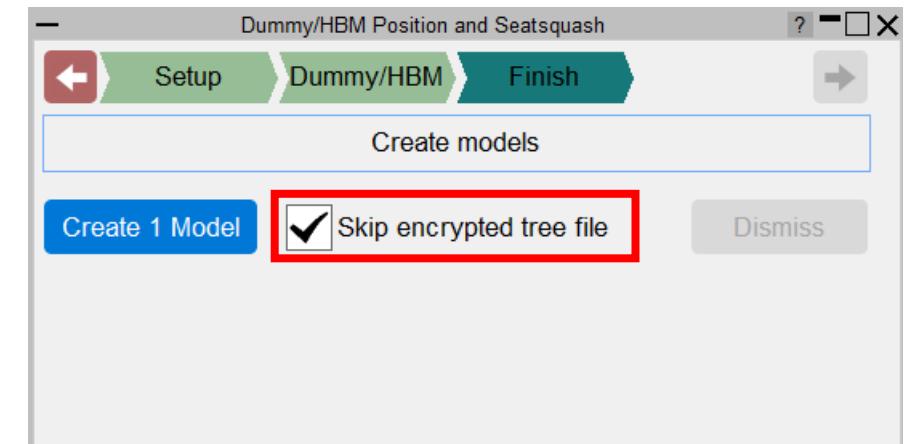
HBM Trees

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.
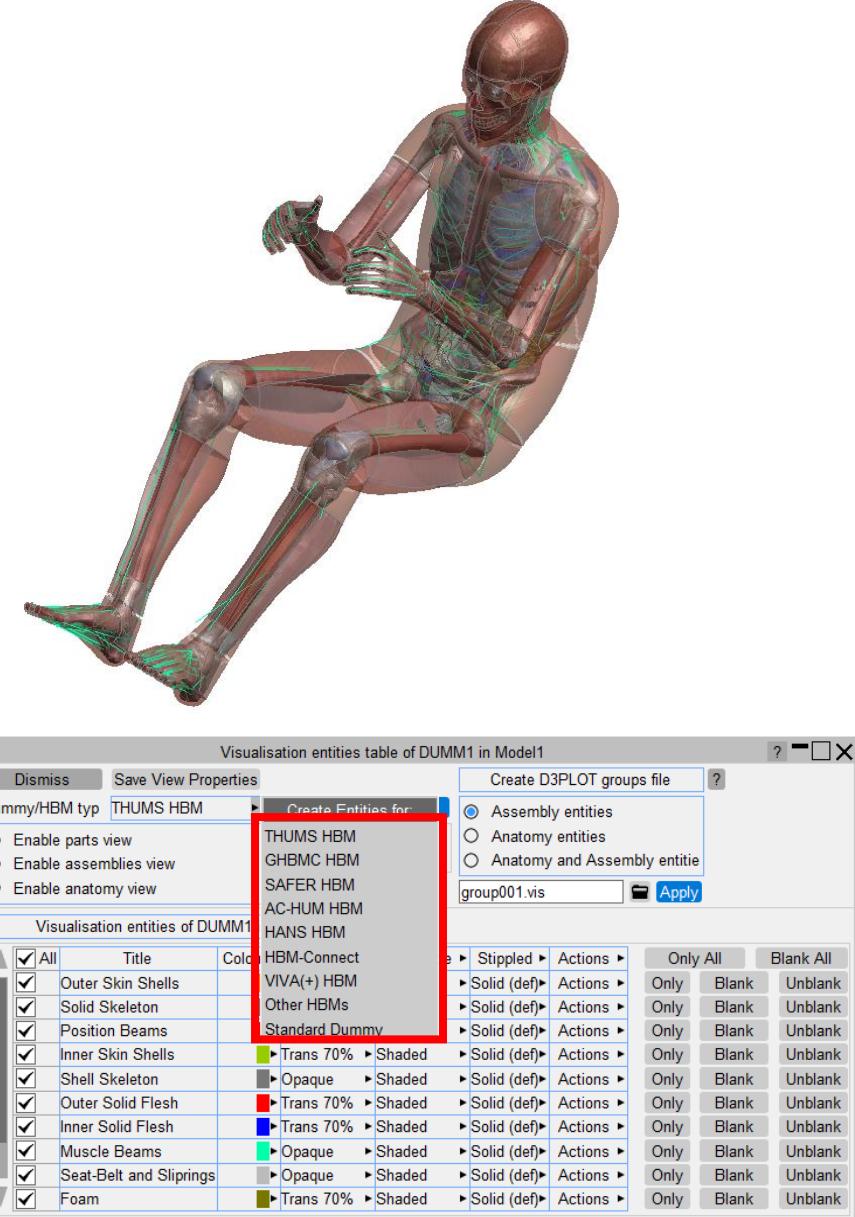
Supported GHBMC models – detailed

- 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

F-05   F-50   M-50   M-95

M-95
M-50
F-05

Detailed Occupants   Detailed Pedestrians
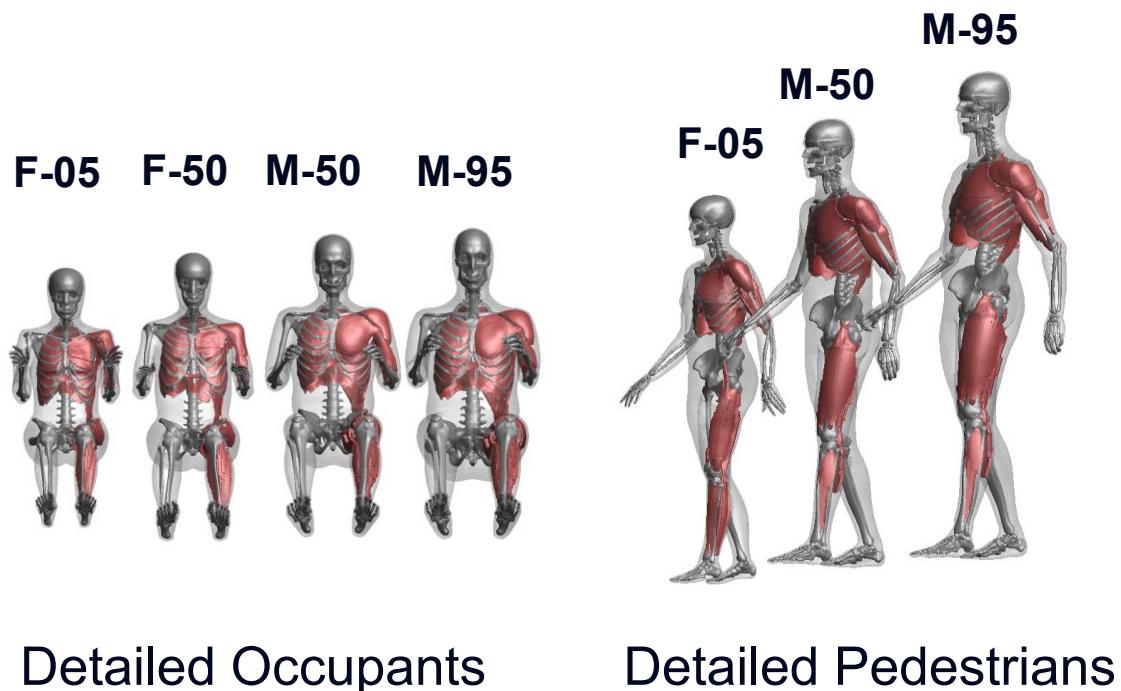
Supported GHBMC models – simplified

- 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

F-05   F-50   M-50   M-95

Simplified Occupants

6-YO   F-05   M-50   M-95

Simplified Pedestrians

Oasys LS-DYNA Environment
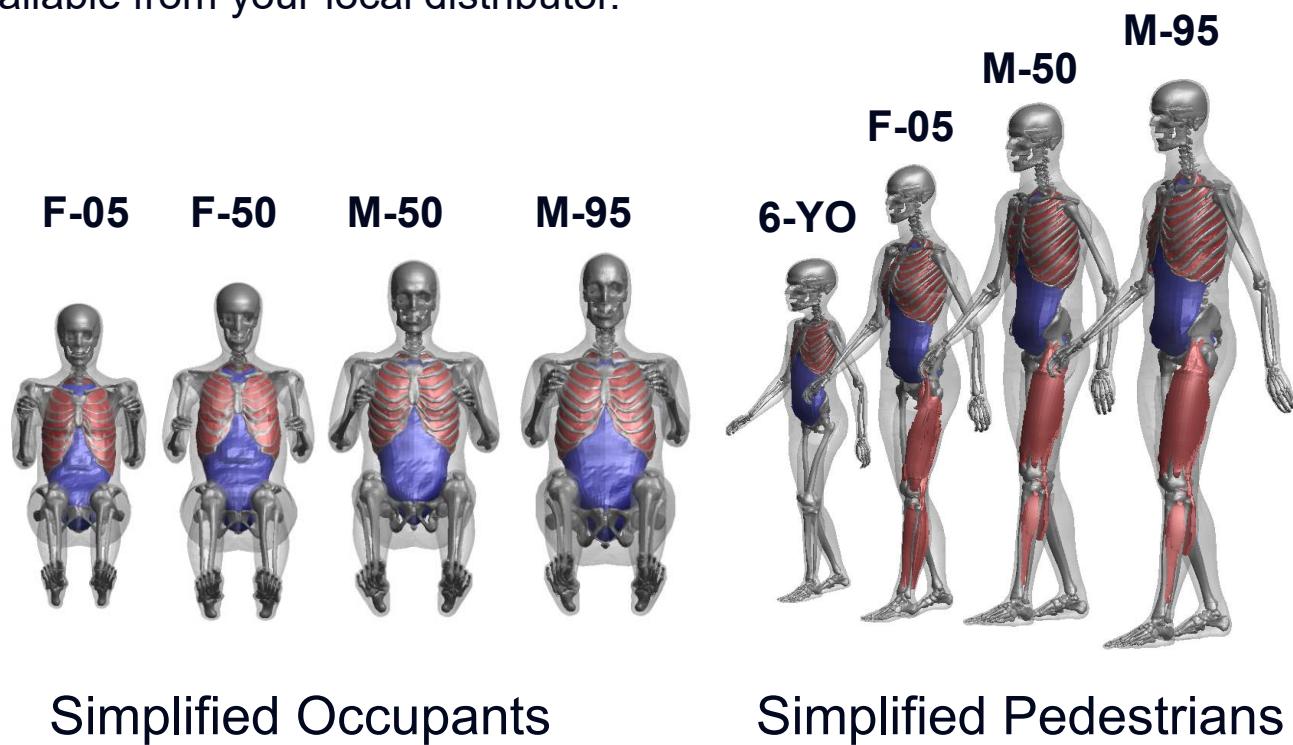
Supported THUMS models

- 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.
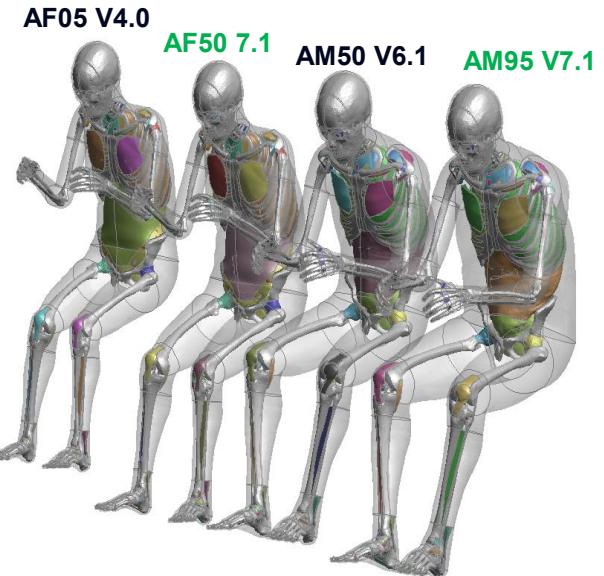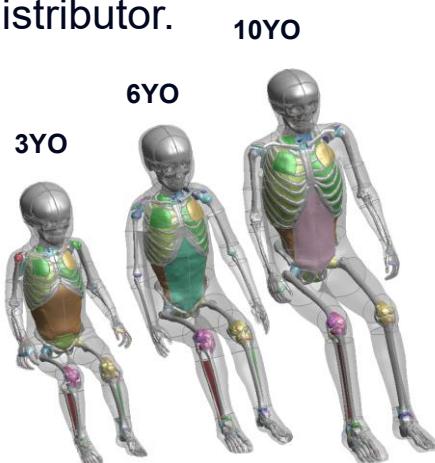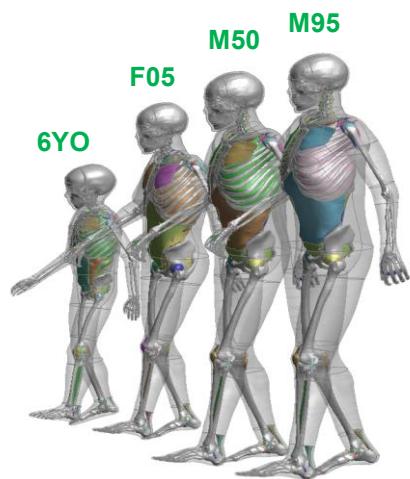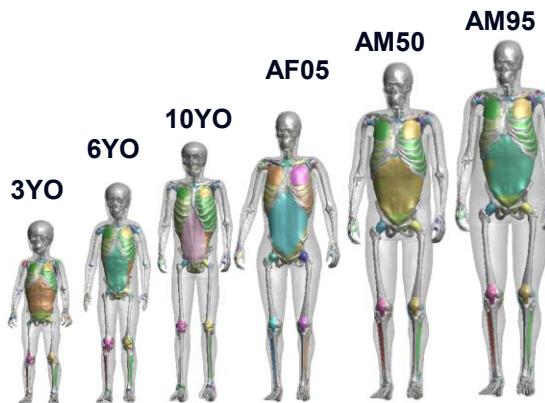
- **Version 4 Pedestrians**:
  - AF05-P v4.02
  - AM50-P v4.02
  - AM95-P v4.02
  - 3YO/6YO/10YO v4.0

- **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.

AM95 45 Deg.　　AM50 35 Deg.　　AF05 25 Deg.

Pregnant AF05

Elderly AF50

Whiplash AM50
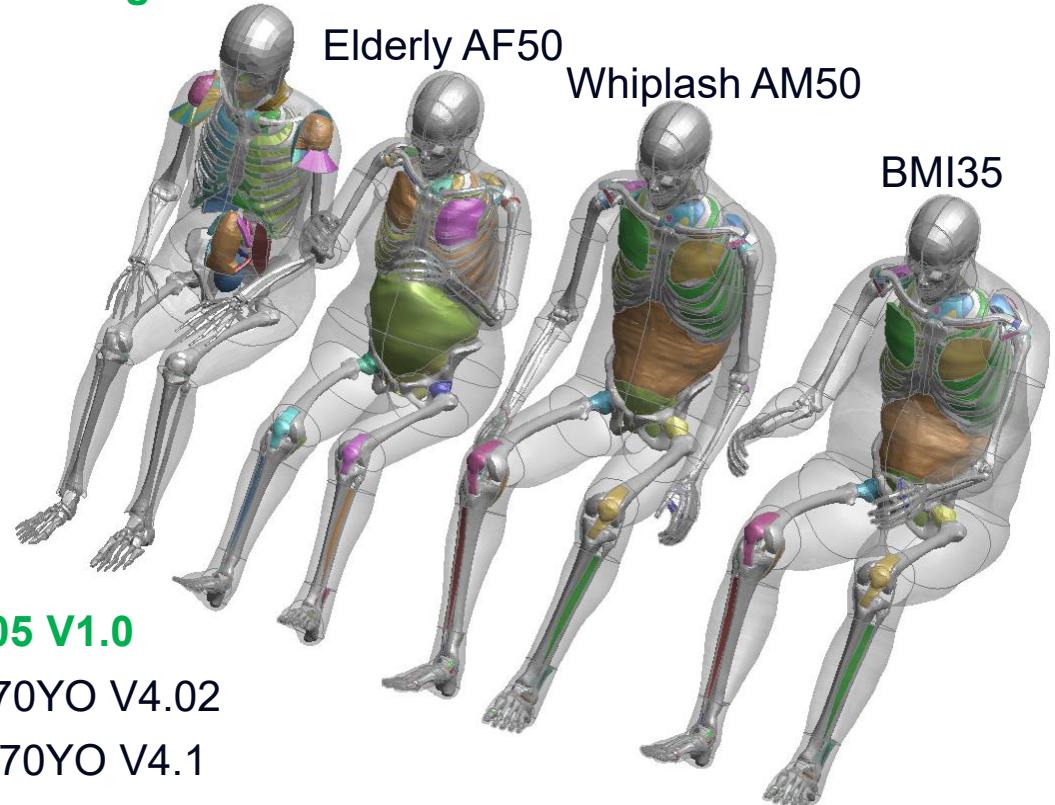
BMI35

- **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

Oasys ∴ LS-DYNA Environment

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.
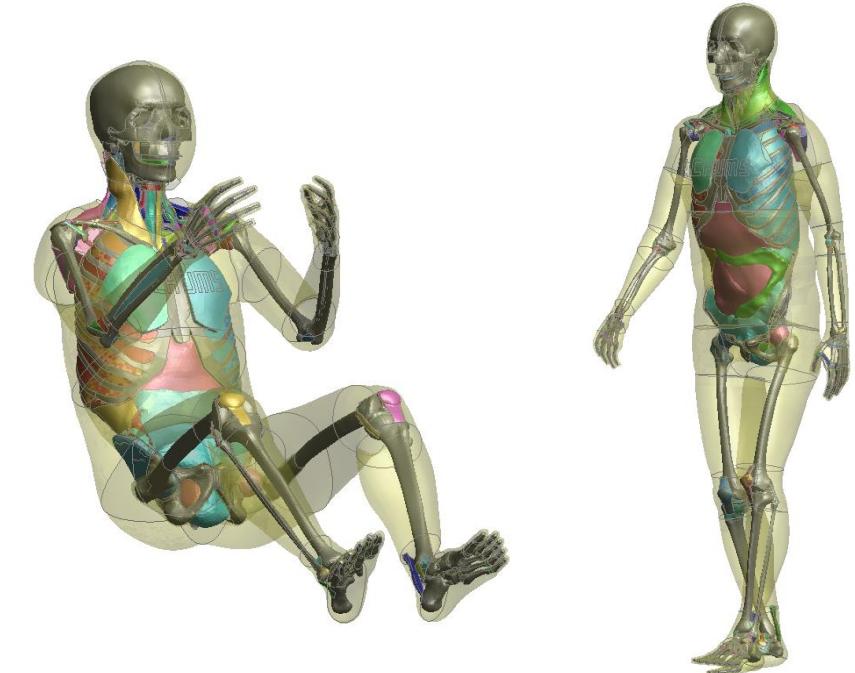
Supported SAFER/VIVA+ HBMs

- 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.

SAFER V11.1.0

VIVA+ 2.0.0 F50/M50

Oasys LS-DYNA Environment
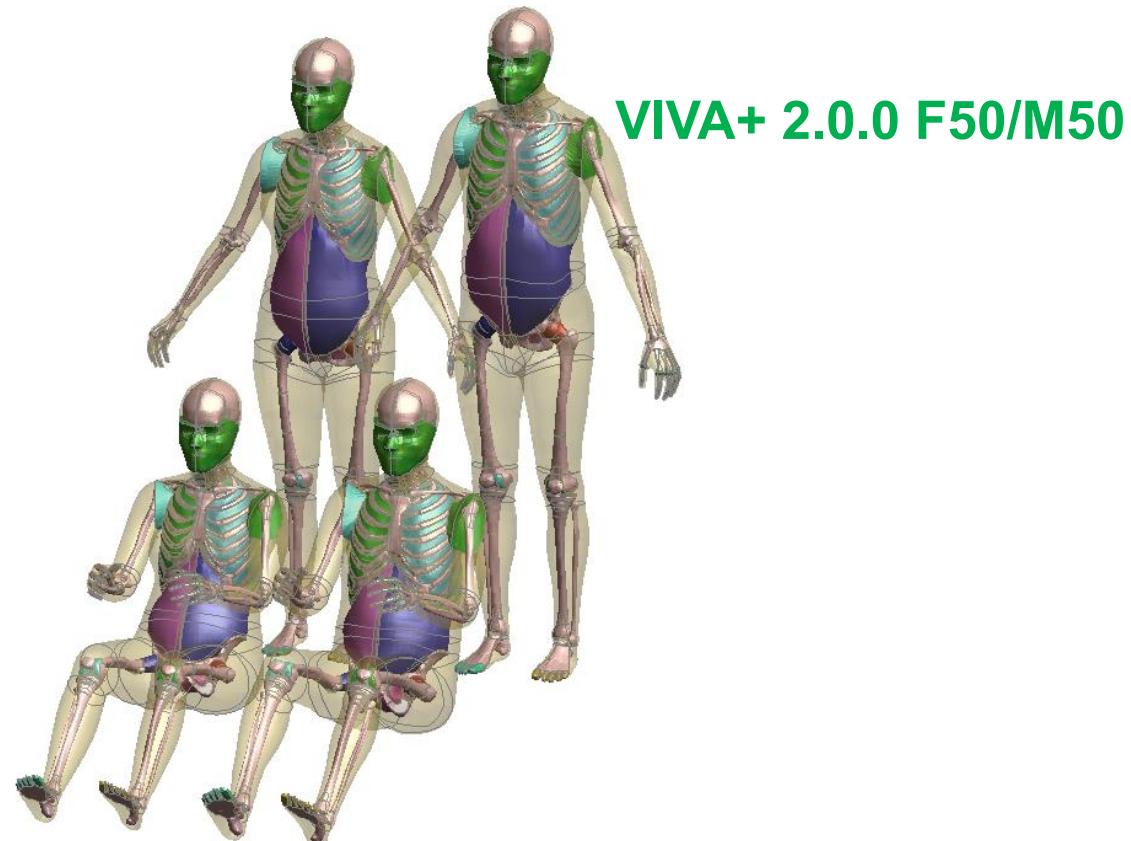
Automotive Protocols

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
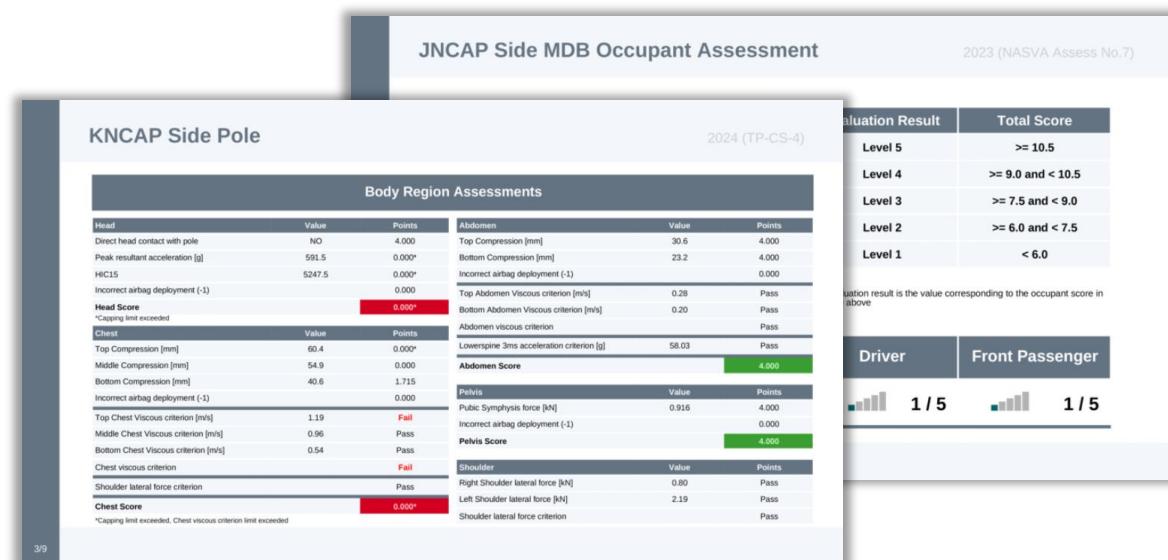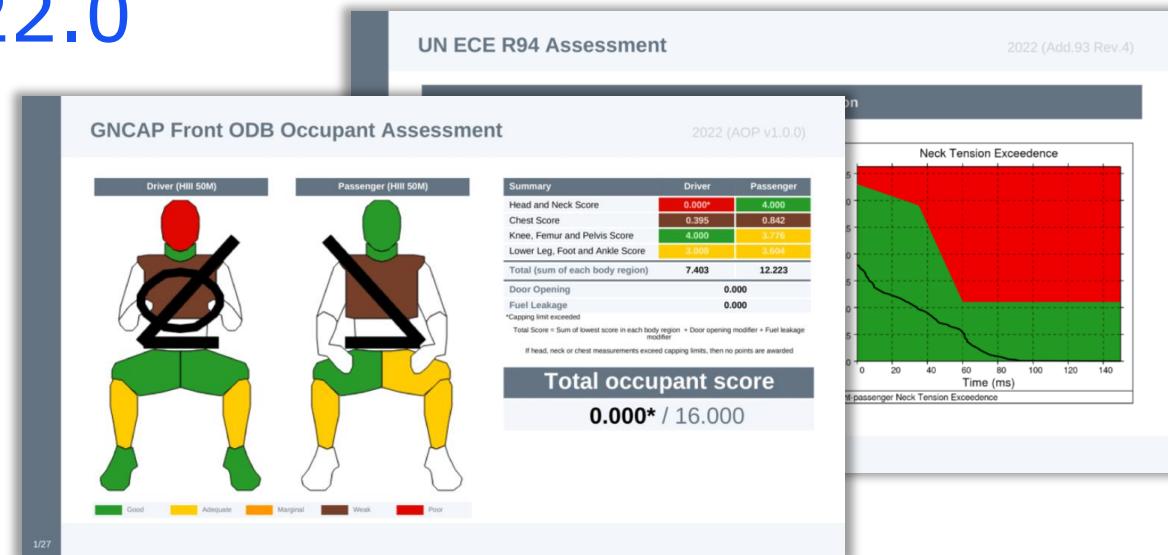
New Protocols and Regulations V22.1

- 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	• Rear Occupants Added
Euro NCAP	MPDB Occupant Assessment	• 2024 (Follows Adult Occupant Protocol v9.3) • Includes DAMAGE assessment
IIHS	Front SOB	• 2024 (Version VII) • New fuel modifier
IIHS	Side MDB	• 2024 (Version IV) • New fuel modifier and updated head protection rating system

Oasys LS-DYNA Environment

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)
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…					

Oasys LS-DYNA Environment

Latest Protocol Support

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		●		●	

Oasys LS-DYNA Environment

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

Legend:
- ● 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)
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)	●	●		●	

Oasys LS-DYNA Environment

Crash Test Setup Enhancements

Crash Test Setup – Various

- In past versions, barriers had to be a 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.
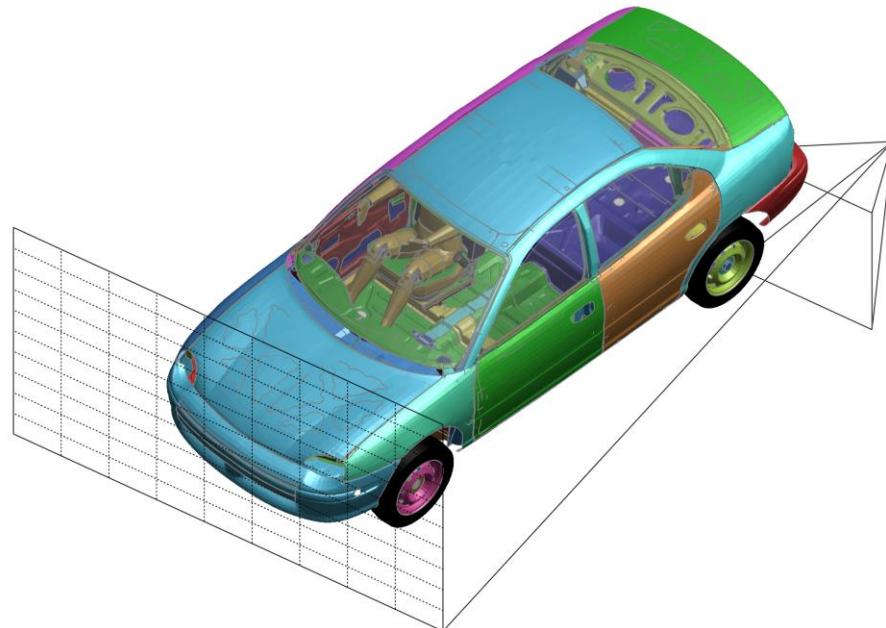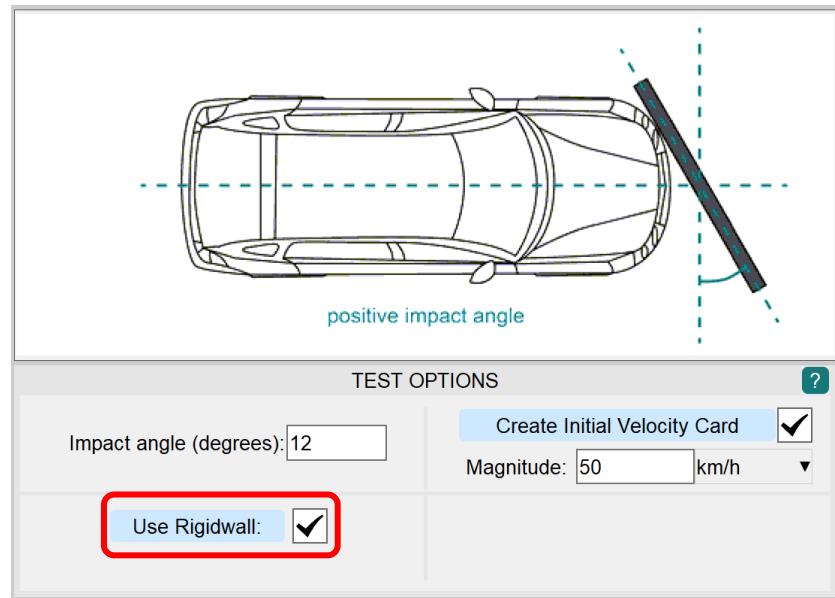
Speed and Performance

User Interface Updates

Oasys LS-DYNA Environment
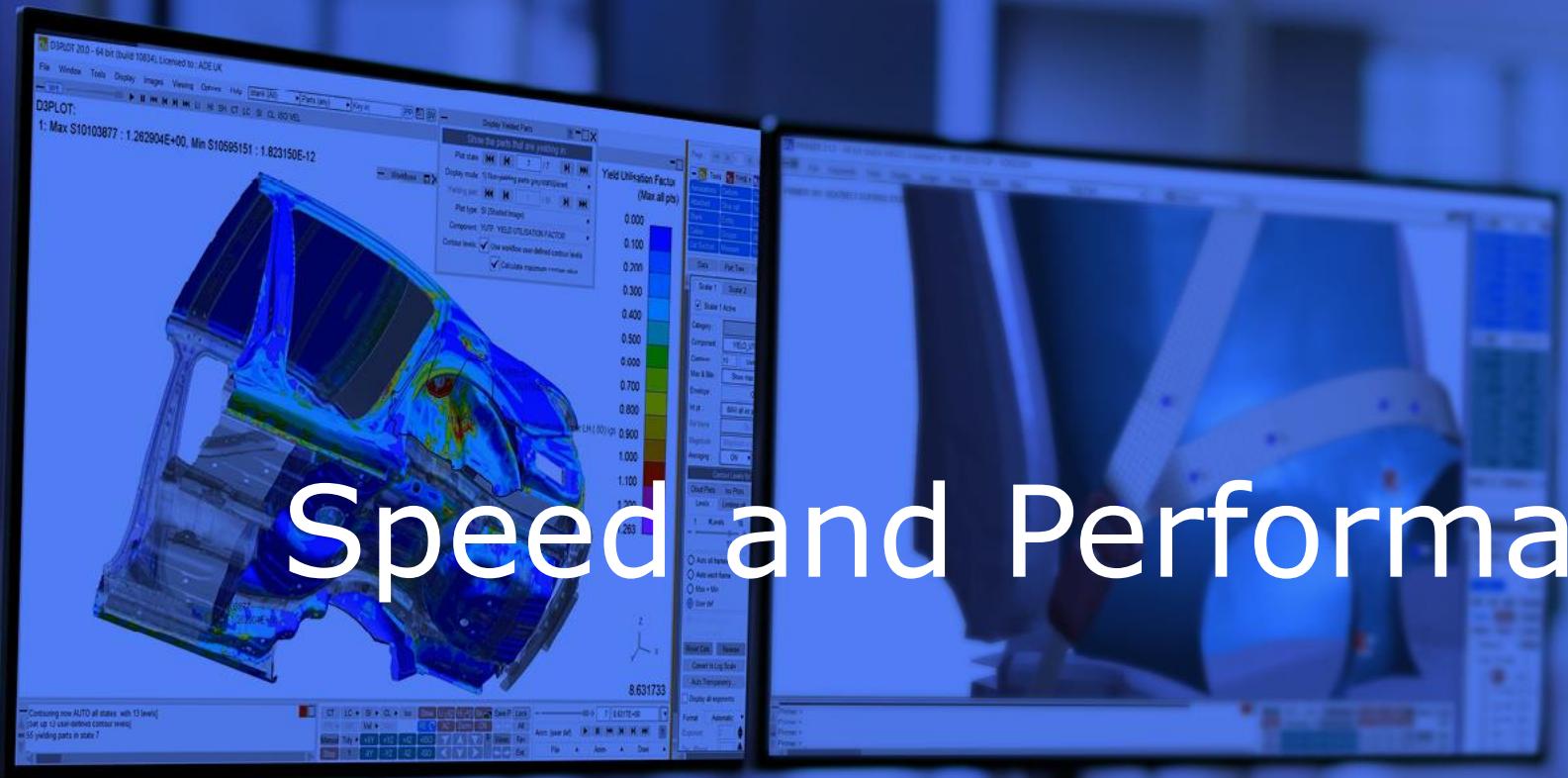
Visualising Node Sets for seatbelt keywords

- 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.
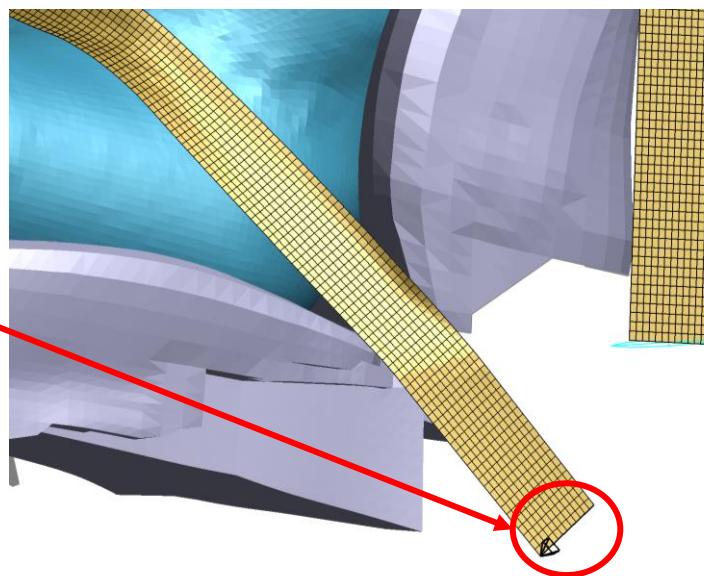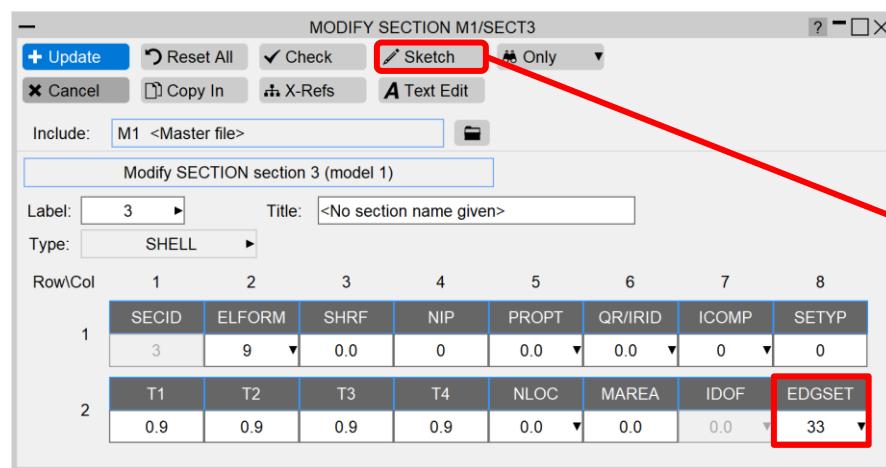
Custom colours for contact surfaces

- 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.
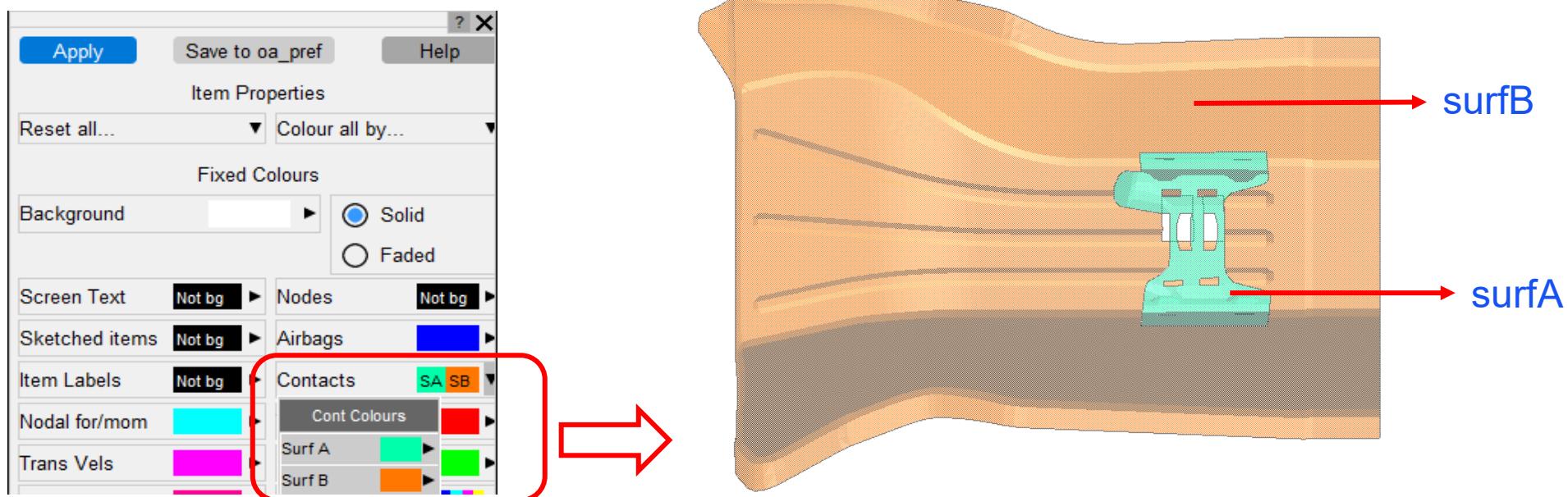
surfB

surfA

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.

surfB

surfA
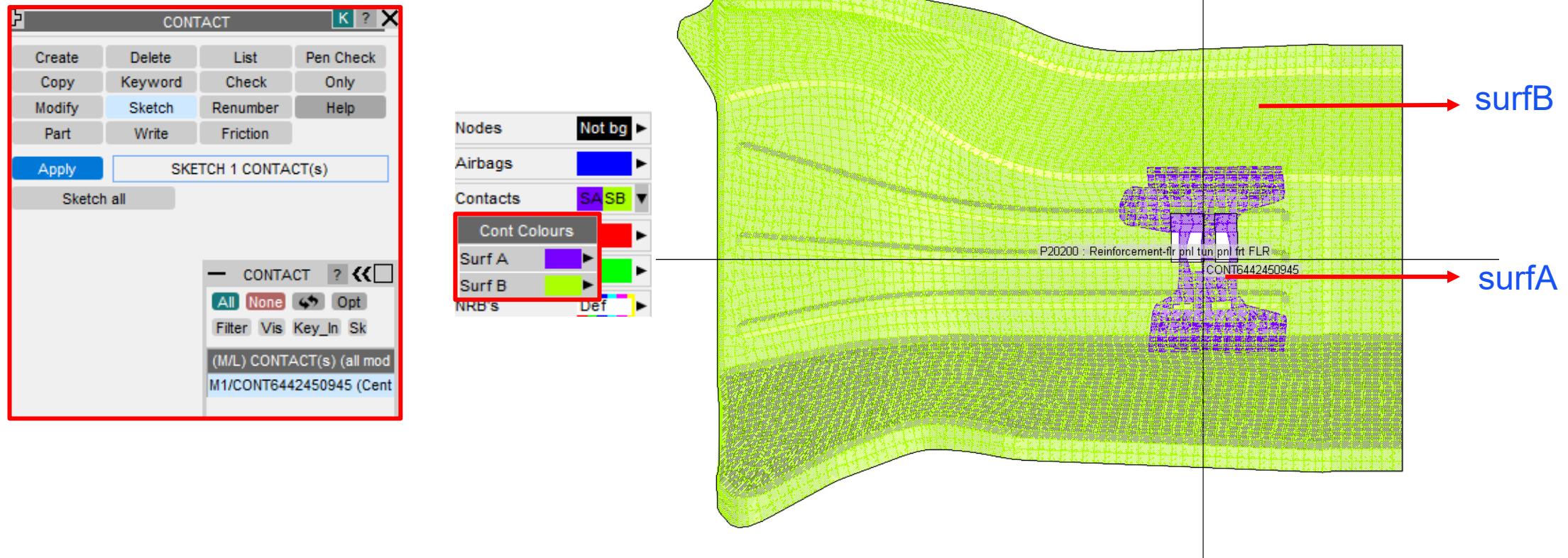
New search to filter drop down options

- A search text box has been added to the 'Select bolt module' drop down when creating bolt connections from a library.
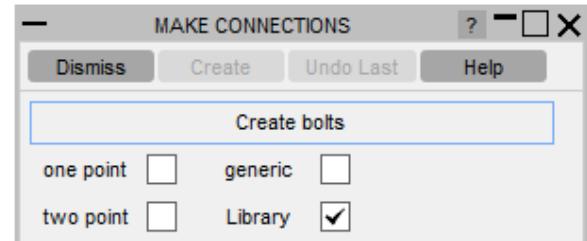
- In previous versions if the bolt library was large, finding the required bolt could be difficult.

- 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.
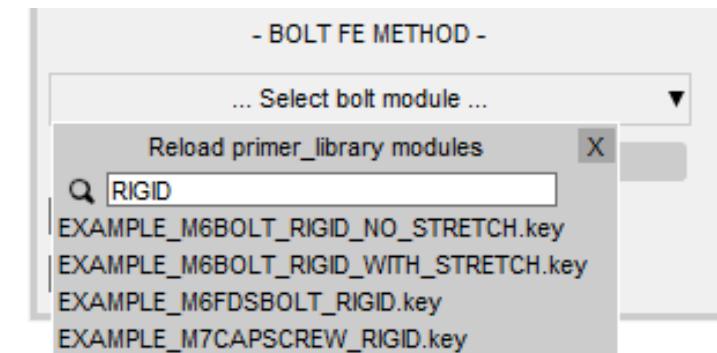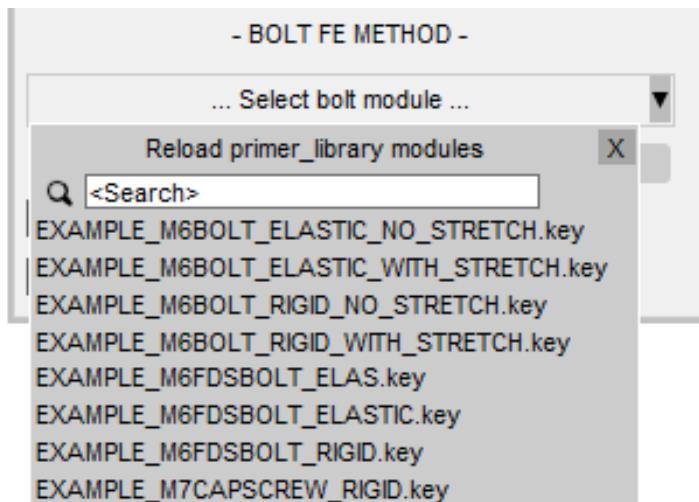
Automatically resize Part Table columns to fit content

- 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.

Contact Penetration

Oasys LS-DYNA Environment

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.

Shell edge without contact radius

Shell edge contact radius
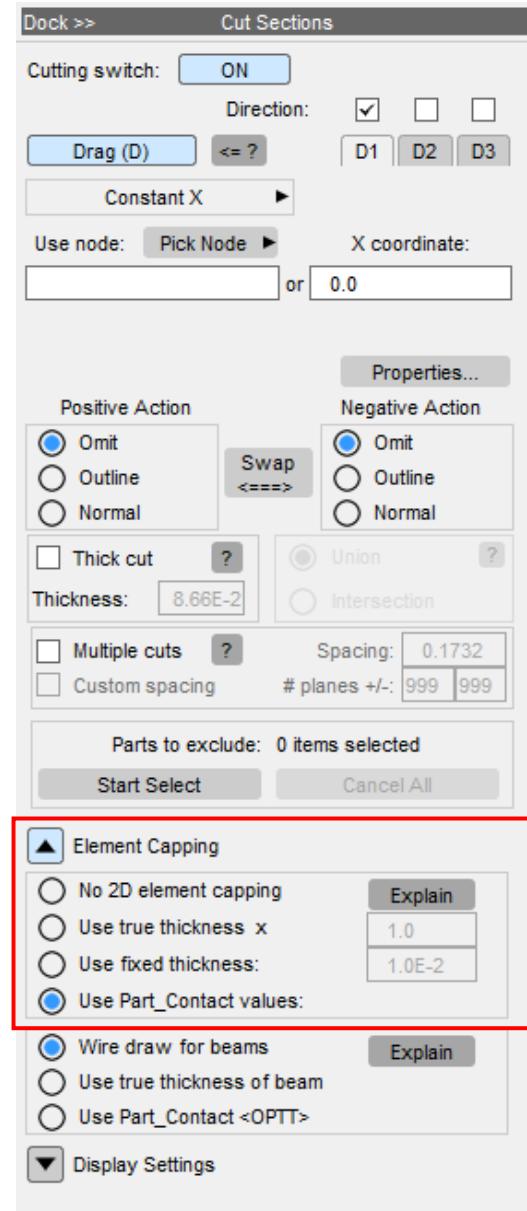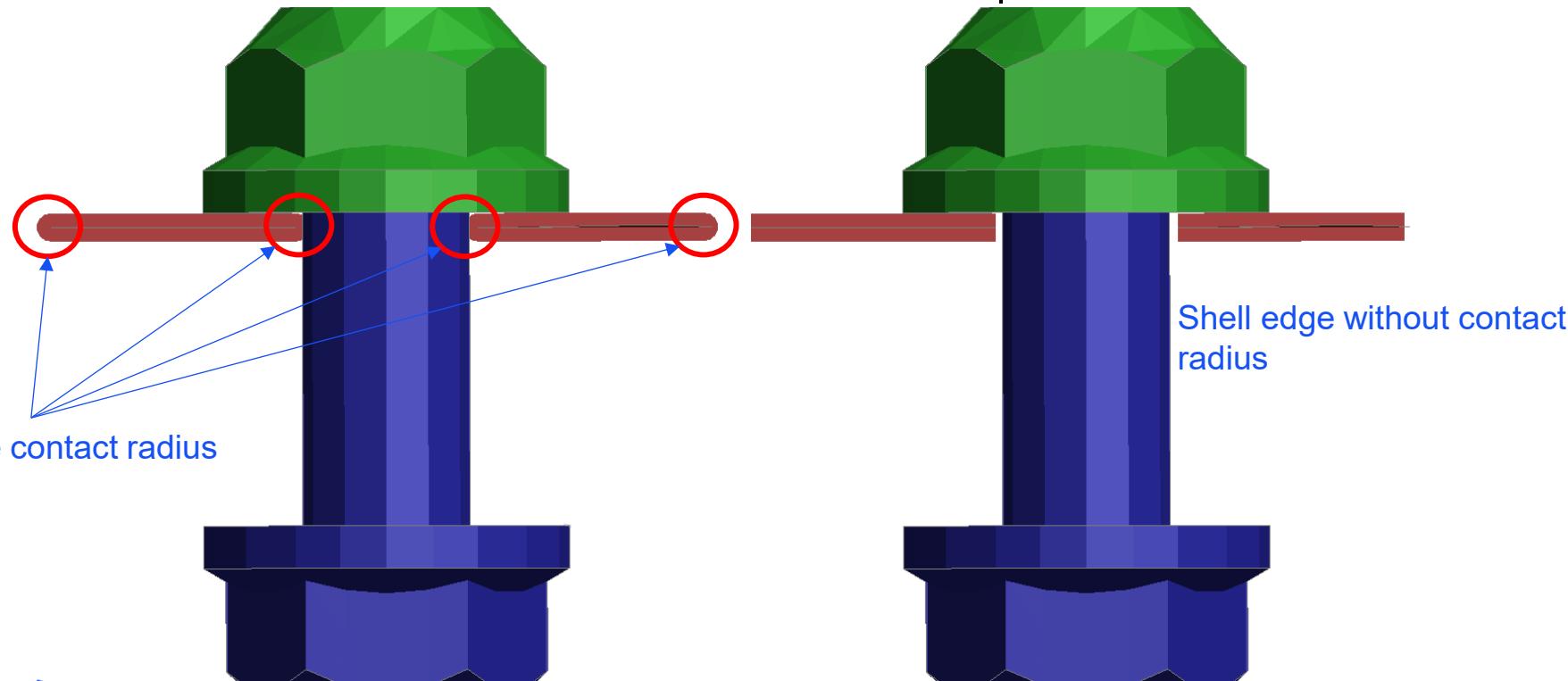
Contact Penetration

- 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.
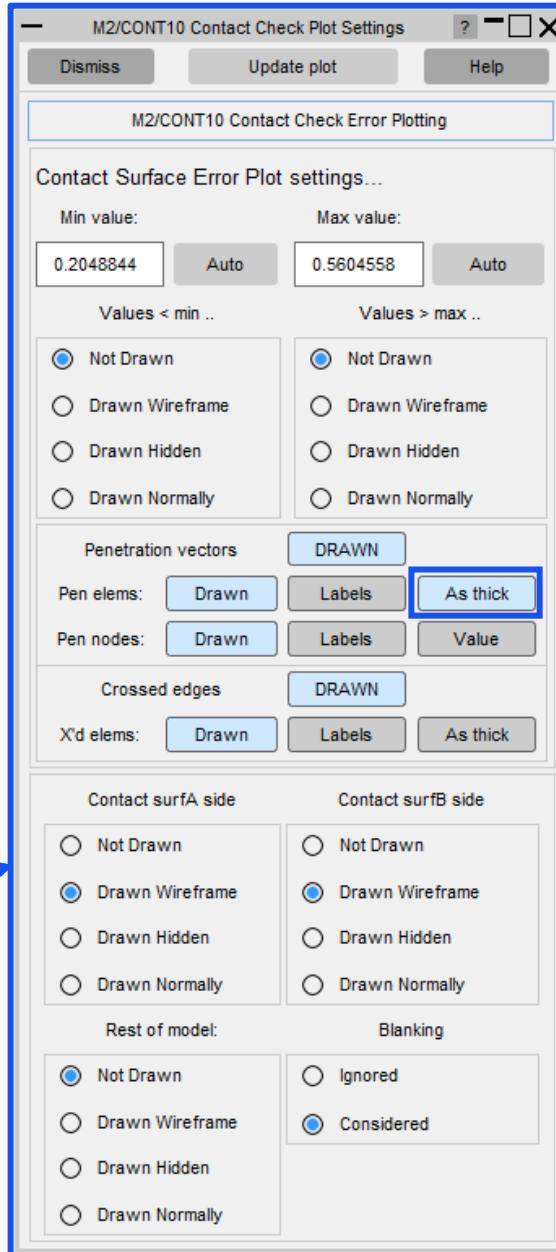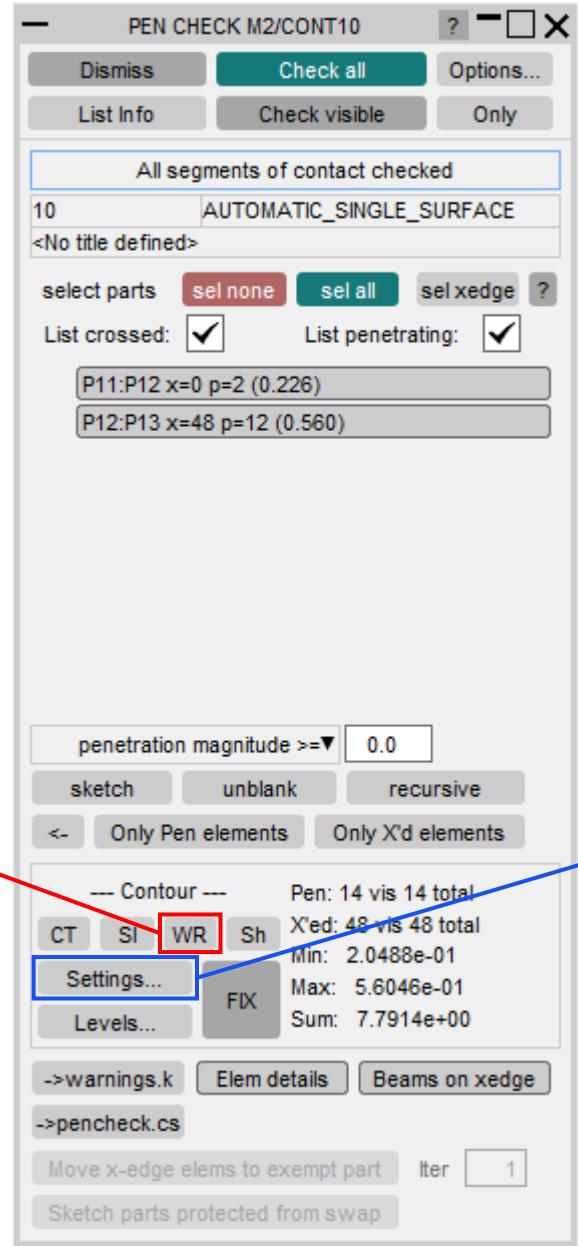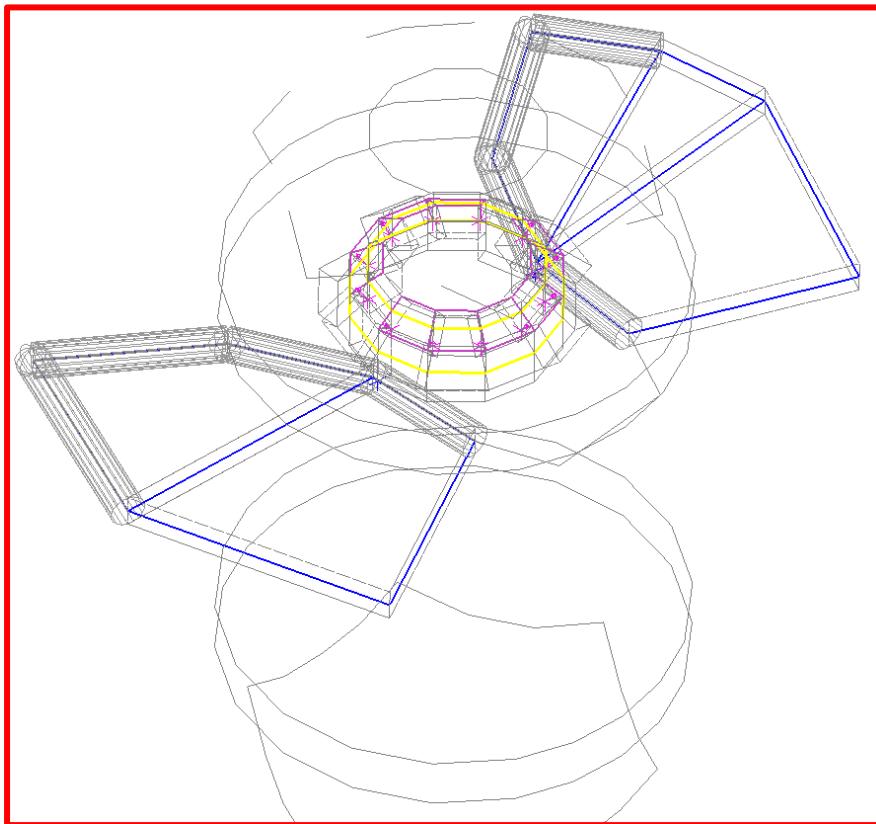
Speed and Precision Improvements

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.
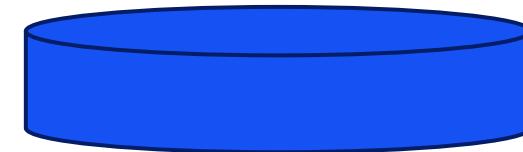
- These caches are used to speed up internal operations, but they must be rebuilt when the model "data_changed" status indicates they are out of date. Rebuilding them can be slow.

- 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.

Oasys ⬡ LS-DYNA Environment

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.

	Tools	Mesh tools ▼	D₃ TH Post
Assign ms	Composite	JavaScript	Other ▼
Attached	Connection	Load Path	Remove
Batteries	Cut Section	Macro	Rigidify
Blanking	Find	Mass Prop	Safety ▼
BOM	Groups	Measure	Text Edit
Check	ICFD Setup	Mechanism	Units
Clipboard	Implicit	Node Import	Workflows
Coat	Include	Orient	Xrefs

Oasys LS-DYNA Environment
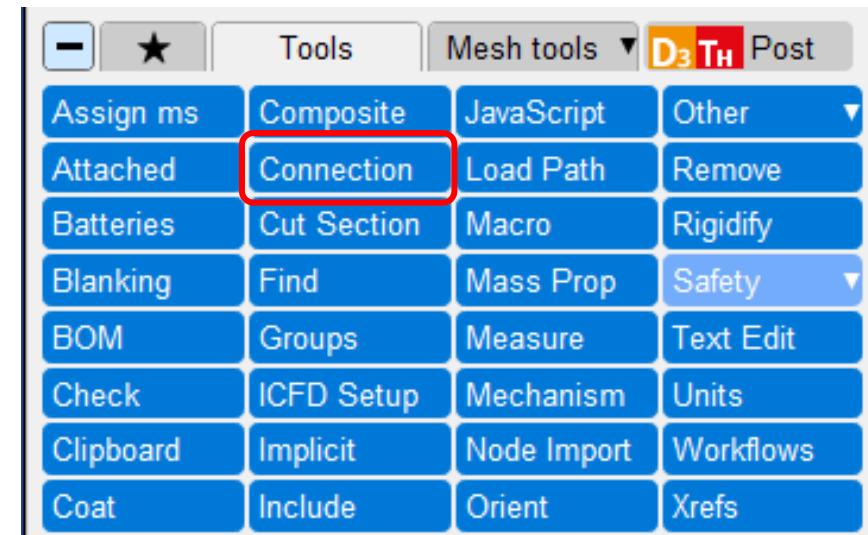
Improvements for very large models

- 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**.
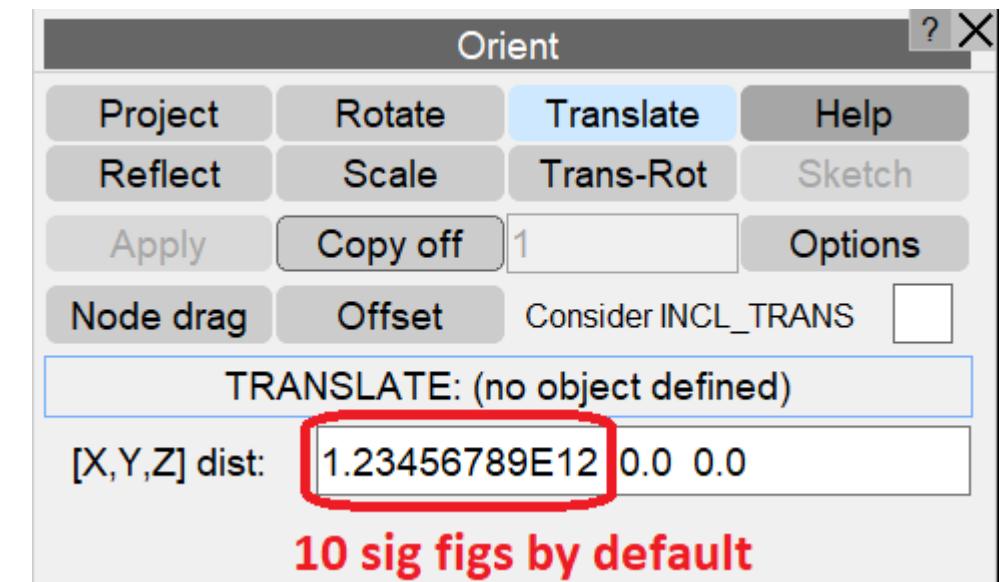
Email Minidump Files

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.
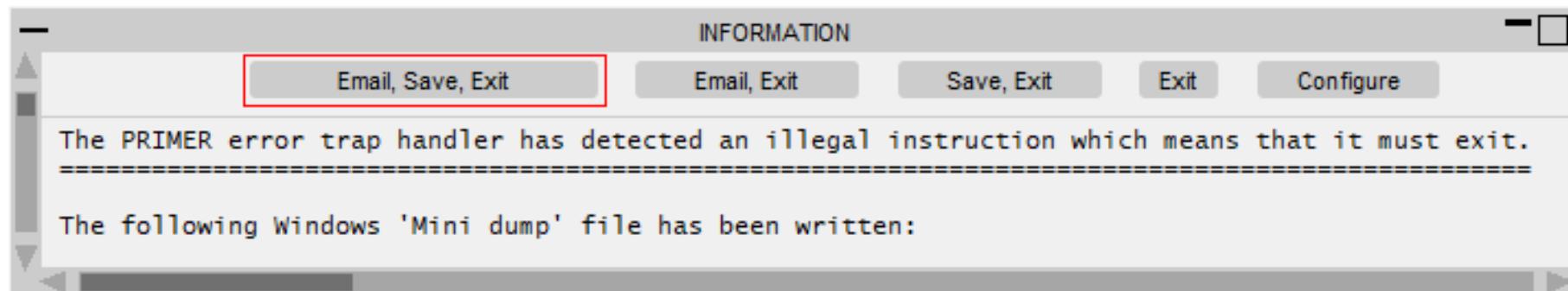
Windows Minidump files can now be emailed (continued)

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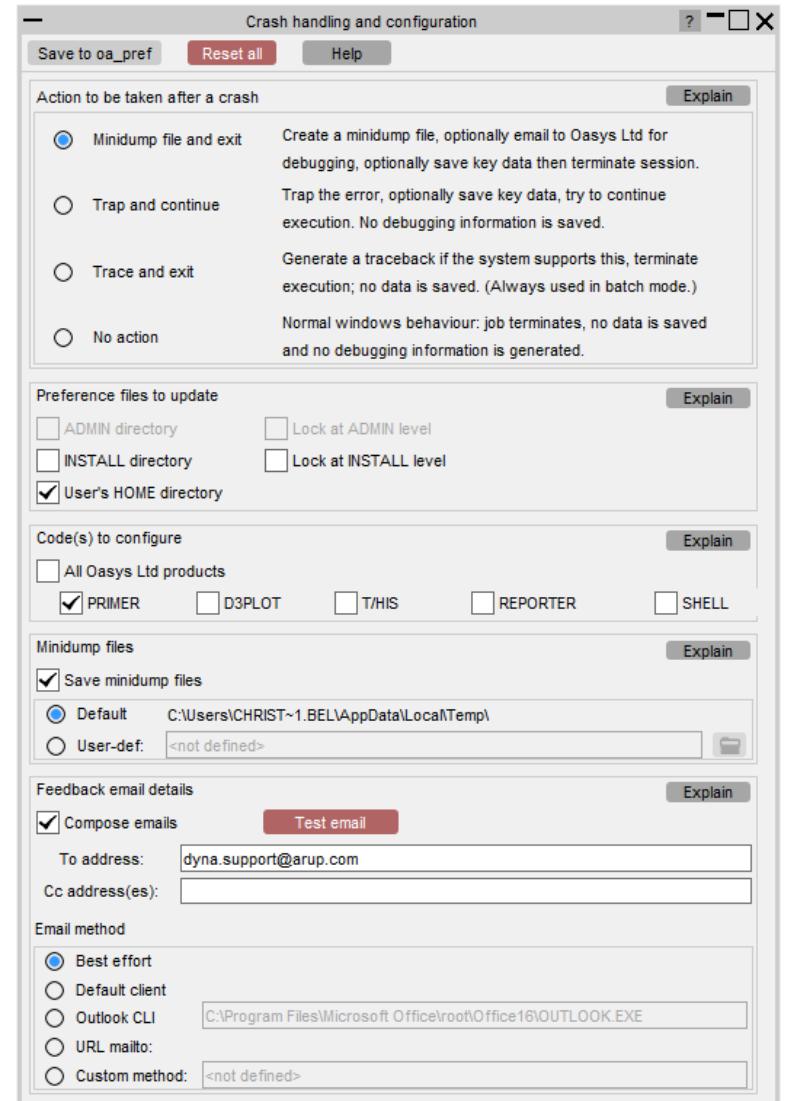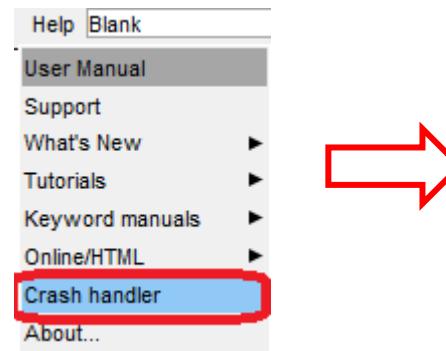
- Crash dump behaviour can also be configured at the "admin" or "installation" levels during software installation, configuring it for all users.

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

Oasys LS-DYNA Environment

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:

```
INFORMATION                                                    — ☐

OK

Warning: Connection to the LMX licence server has been lost for 365 seconds
========

A connection loss of up to 600s is permitted after which this process will be suspended,
which will occur in 235 seconds if connection is not restored.

It is recommended that you save any pending work.
```

Oasys :: LS-DYNA Environment
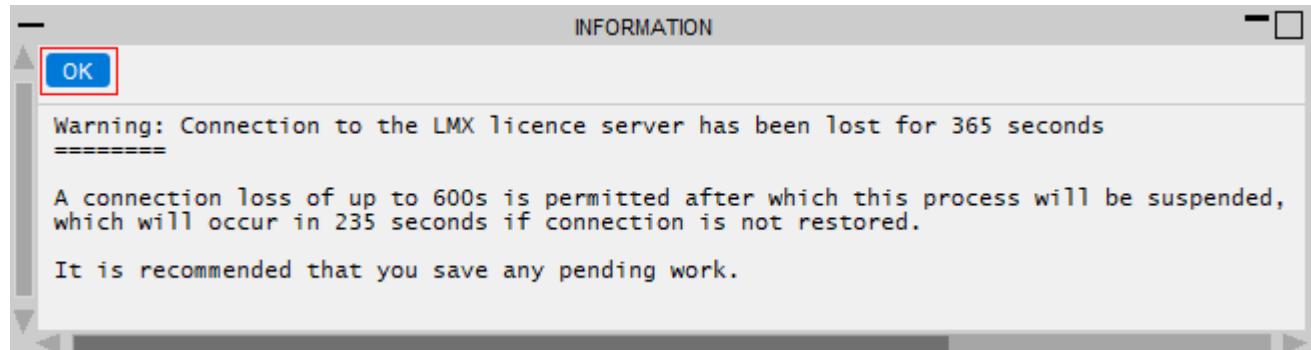
Improved LMX server connection loss behaviour (V22.1)

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.
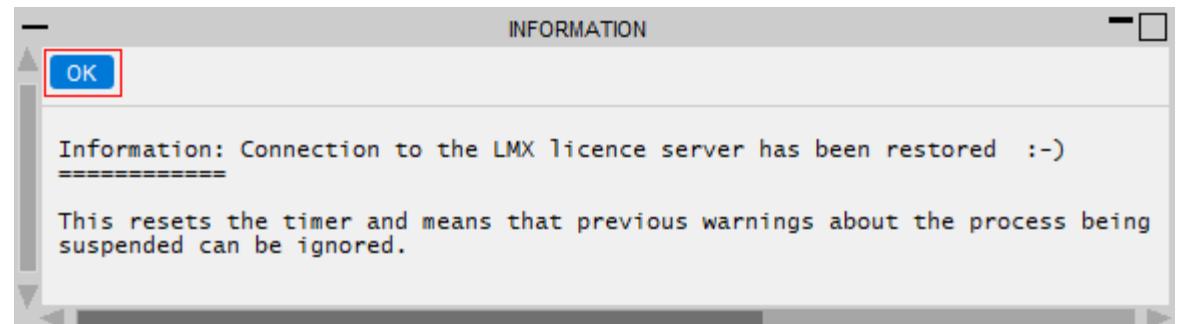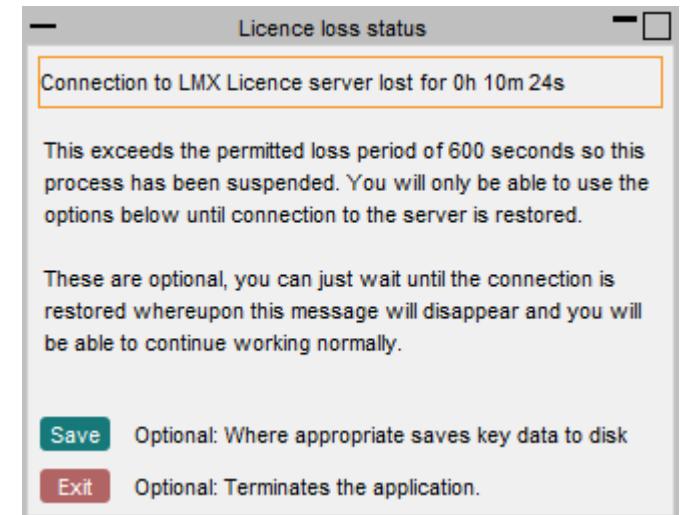
Initial Window Placement

Oasys LS-DYNA Environment

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:
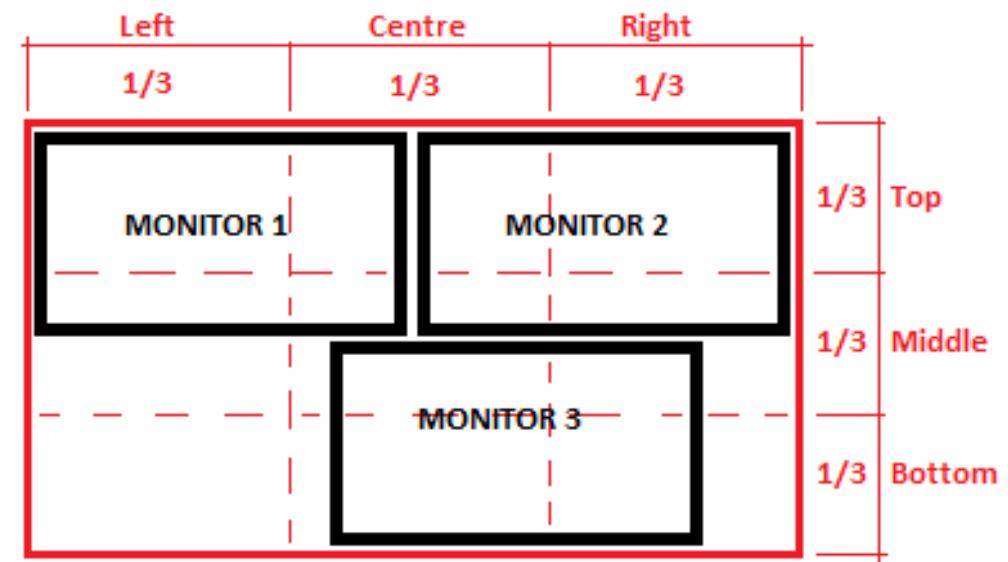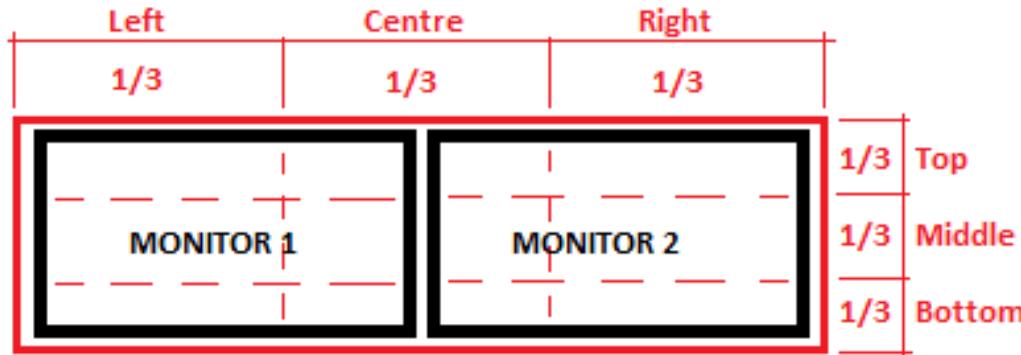
- The preference value may be a combination of
  LEFT | CENTRE | RIGHT
  and / or
  TOP | MIDDLE | BOTTOM   The monitor nearest to the centre of that 1/3rd sub-area is used.

Flexible Automation and Integration

Updates to both JavaScript and Python APIs

Oasys LS-DYNA Environment
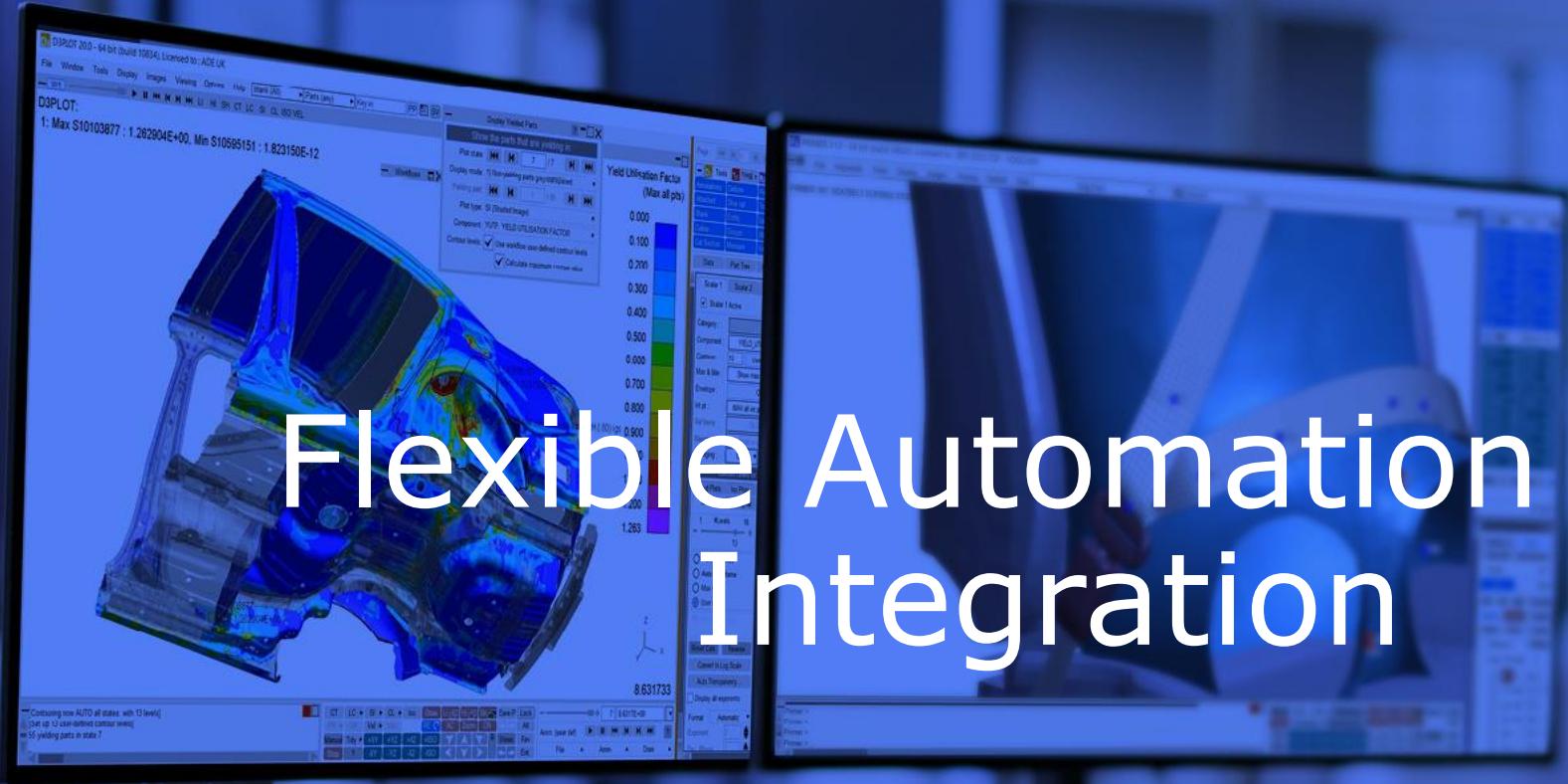
Updates to both JavaScript and Python

- 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.

Oasys LS-DYNA Environment

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)
  ```
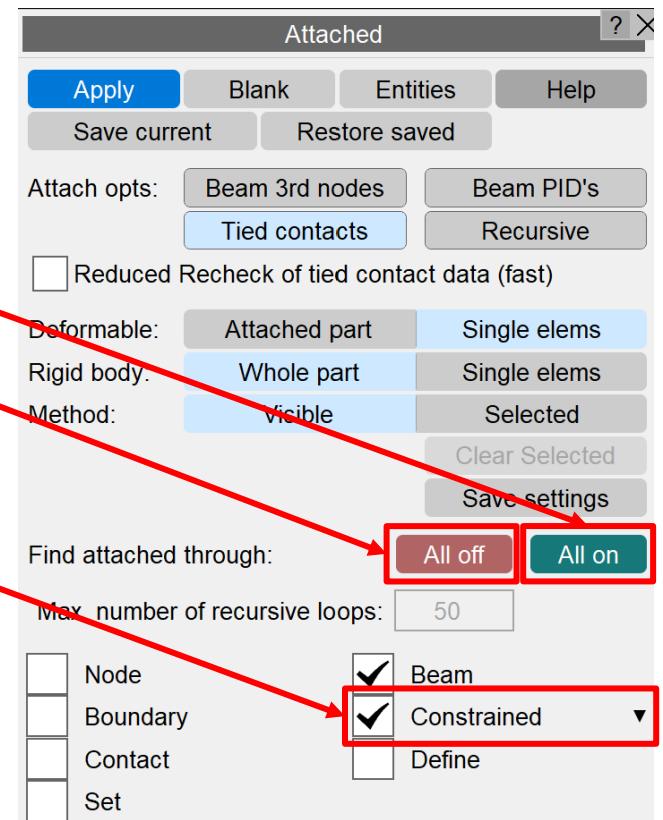
JavaScript specific updates

Oasys LS-DYNA Environment

JavaScript API

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

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Python specific updates

Oasys LS-DYNA Environment

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_SOLID**s are now rendered, allowing for visualisation and graphical picking.

- Parametric trim faces (***IGA_FACE_UVW**s) and parametric trim edges (***IGA_EDGE_UVW**s), for parent ***IGA_SOLID**s and ***IGA_SHELL**s 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.

*IGA – Visualisation

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

*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()`


```
IGA
    IGA1DBrep class
    IGA1DNurbsUVW class
    IGA1DNurbsXYZ class
    IGA2DBasisTransformXYZ class
    IGA2DBrep class
    IGA2DNurbsUVW class
    IGA2DNurbsXYZ class
    IGA3DBasisTransformXYZ class
    IGA3DNurbsXYZ class
    IGAEdgeUVW class
    IGAEdgeXYZ class
    IGAFaceUVW class
    IGAFaceXYZ class
    IGAIntegrationShellReduce class
    IGAIntegrationSolidReduce class
    IGAMass class
    IGAPointUVW class
    IGAShell class
    IGASolid class
    IGAVolumeXYZ class
```

D3PLOT Link Changes

Oasys LS-DYNA Environment

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
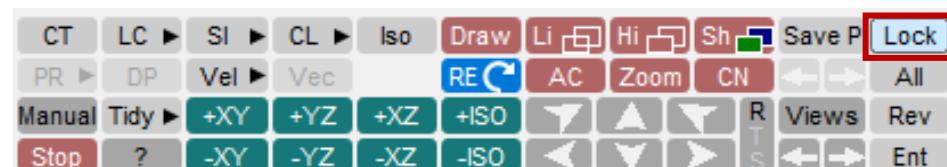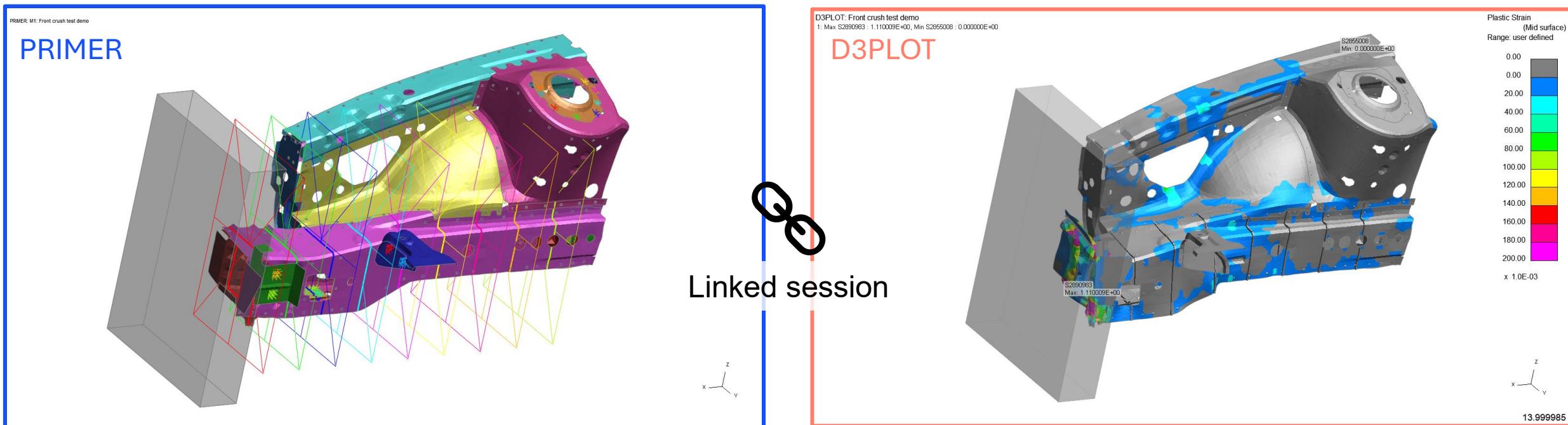
Other Developments and Preferences

Control Calc DT2MS tool

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

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

Oasys LS-DYNA Environment

*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_TABLEs and offers an autofix.
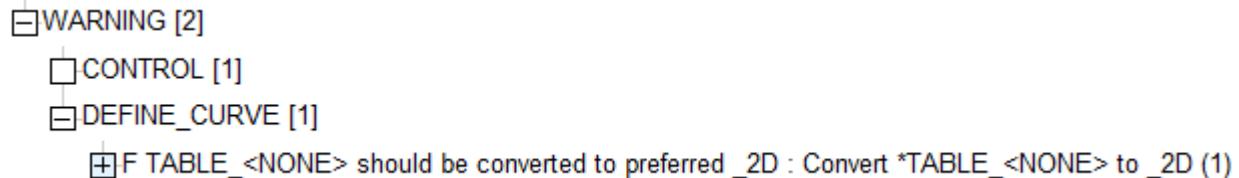
- The drop-down on the *DEFINE_TABLE edit panel now permits conversion to _2D format.
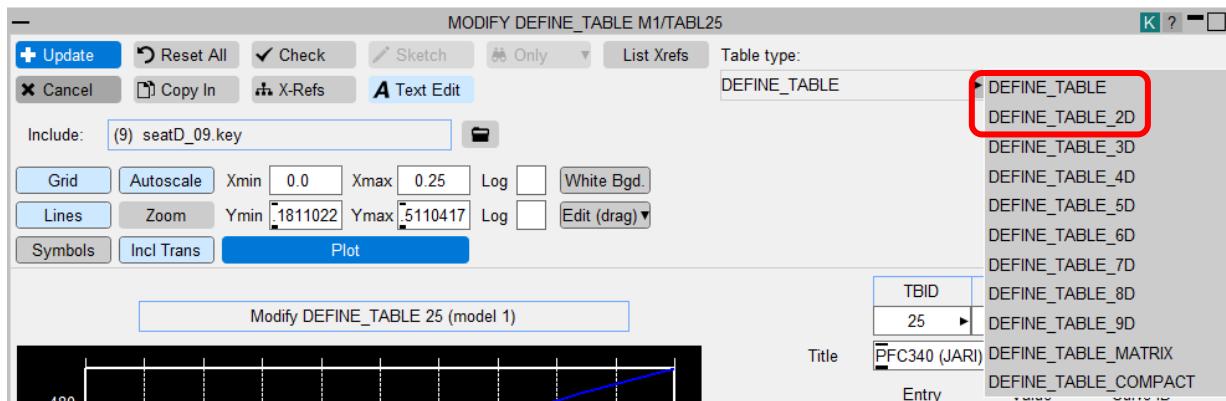
Mesh – extrude solids

- 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.
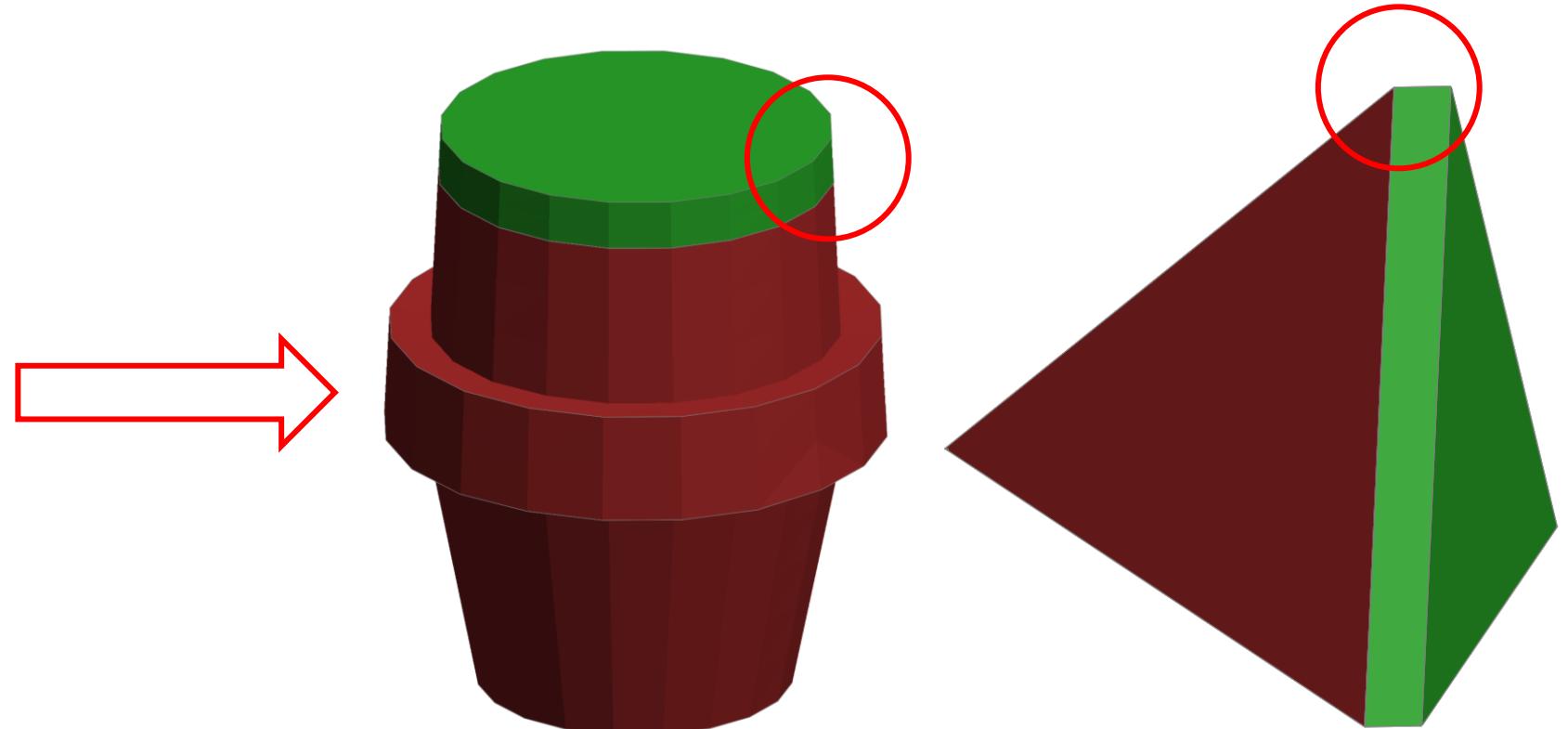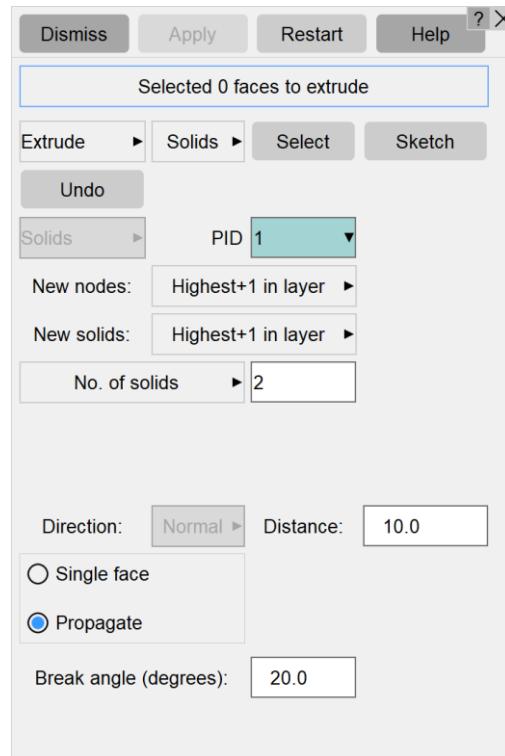
Mesh – extrude solids

- This new option is supported for up to 8 noded solids. Extrusion of higher order solids is not currently possible.
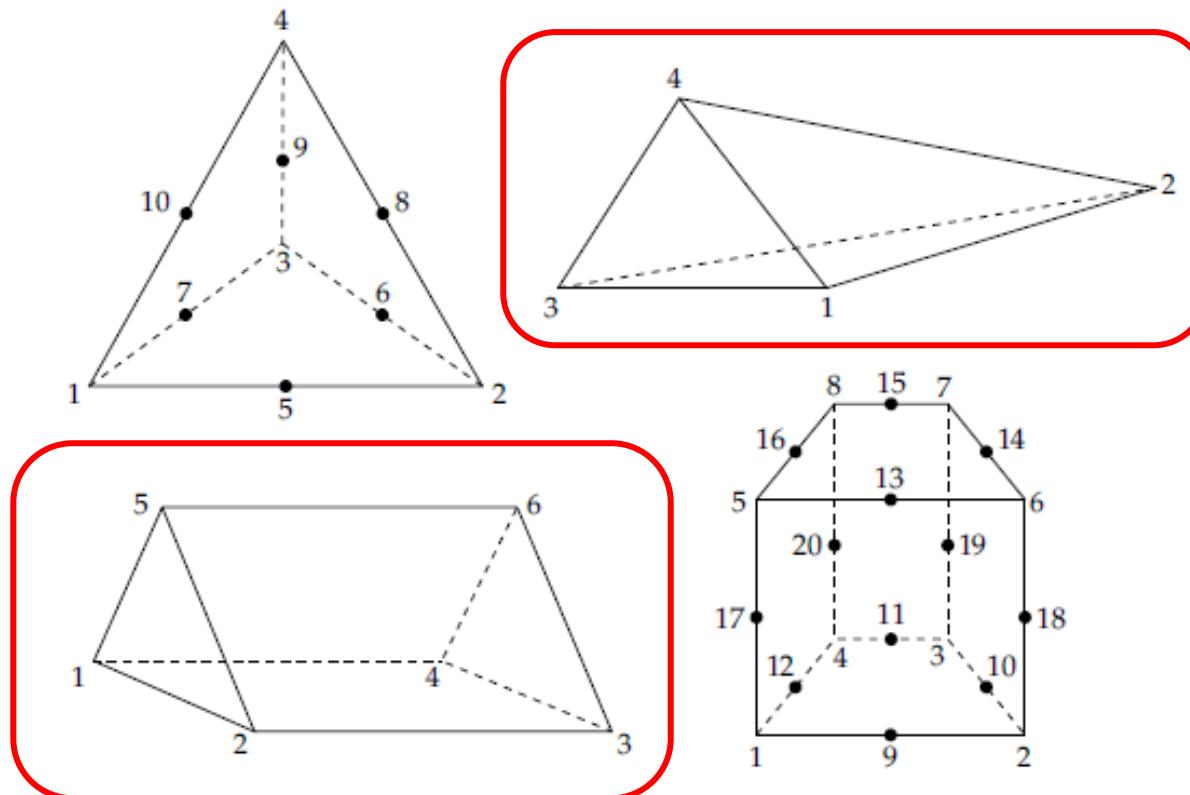
Mesh – Ruled Discrete/Continuous selection

- 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.
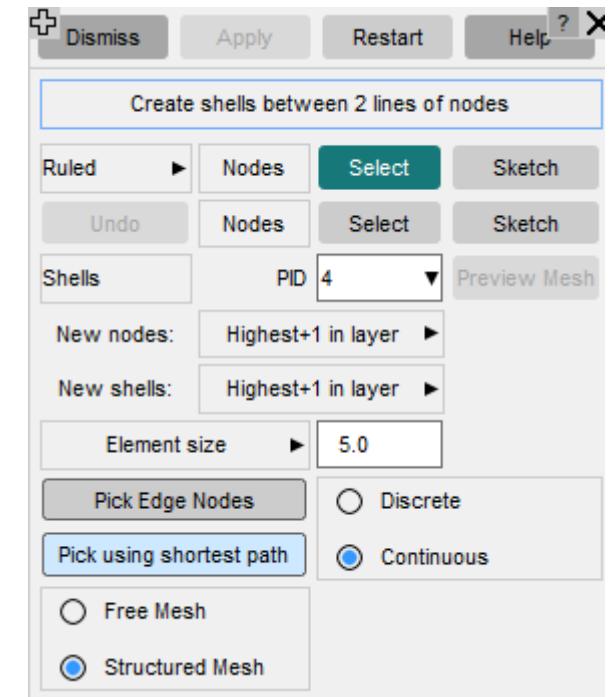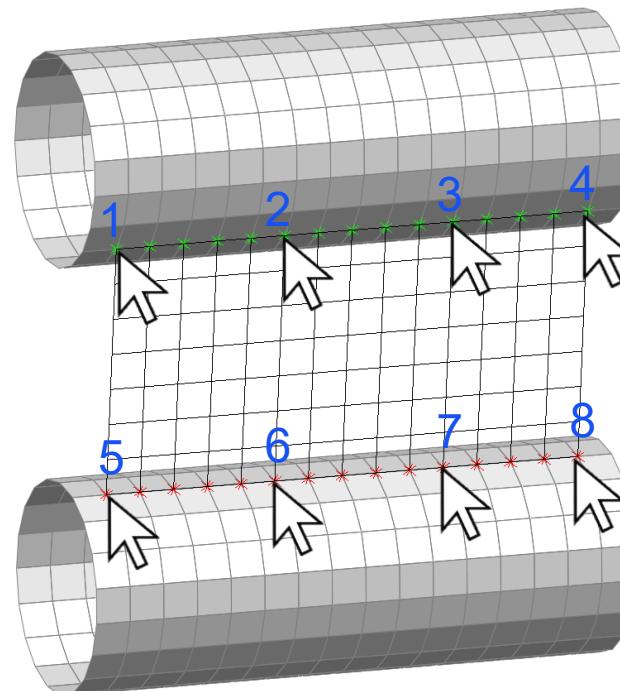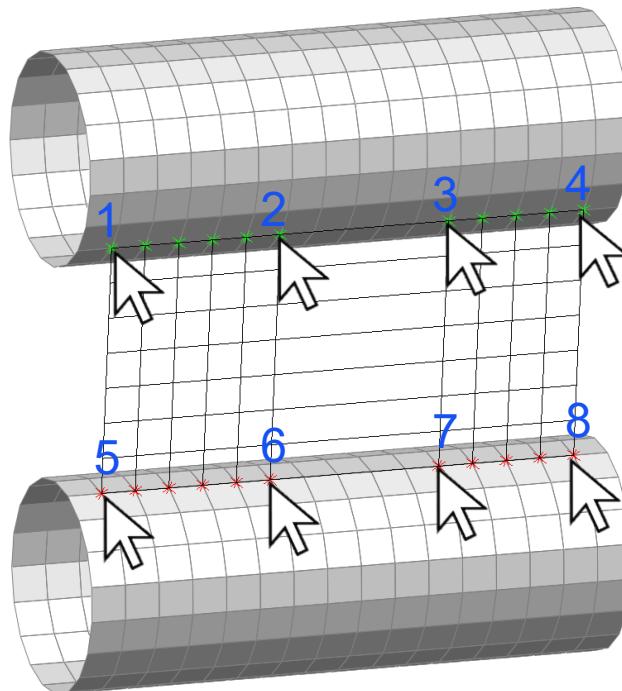
Parameter Expressions

- PRIMER 22.0 now supports `pow(x,y)` as well as the previously supported format: `x**y`.

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.
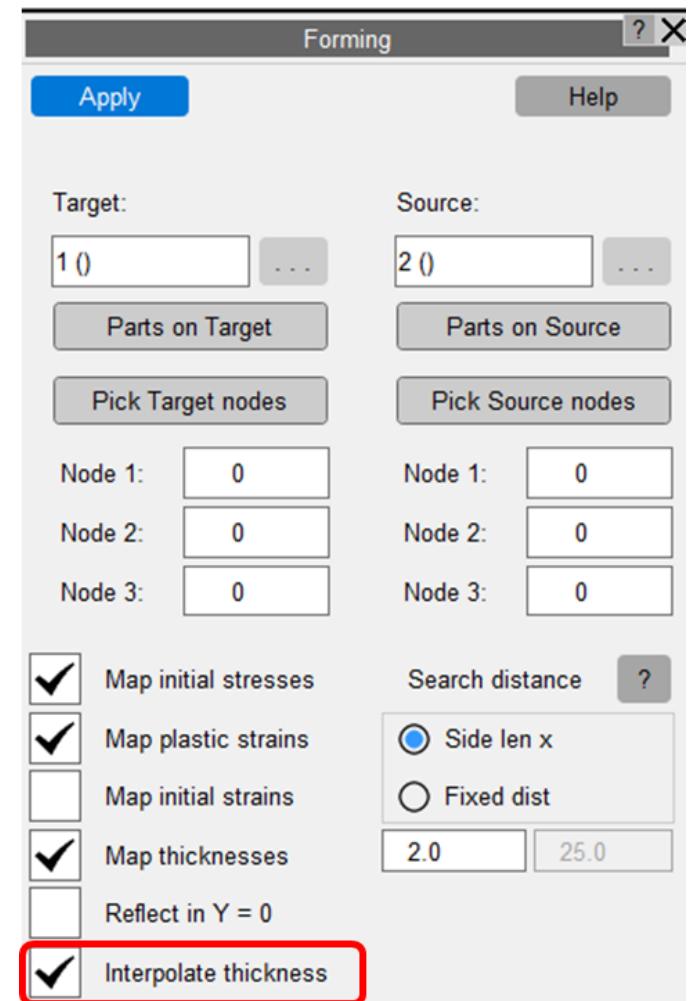
Forming tool – Interpolate shell thickness

Mapping shell thickness from Shell 1 (green) onto Shell 2 (red) using the forming tool:
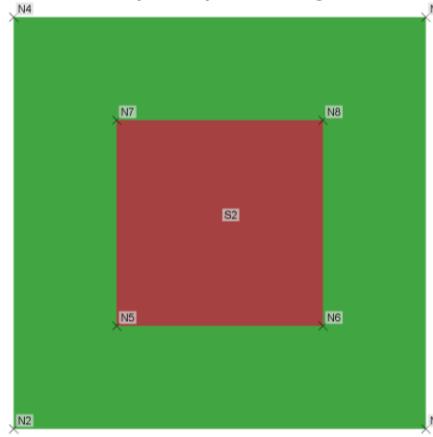
Shell 1 has thickness 0 at nodes N2, N3 and thickness 4 at nodes N4, N5:

Mapping shell thickness
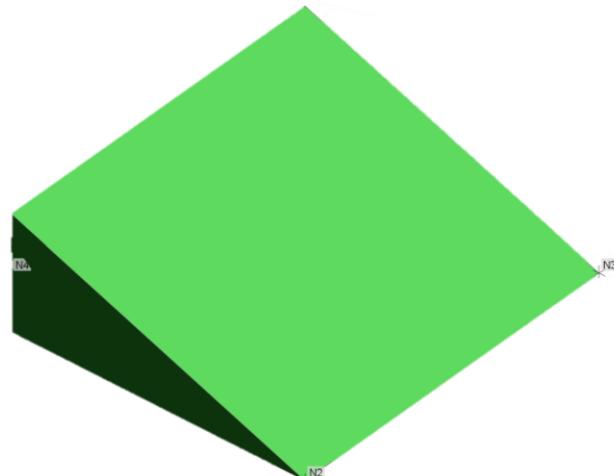
Using new thickness interpolation:
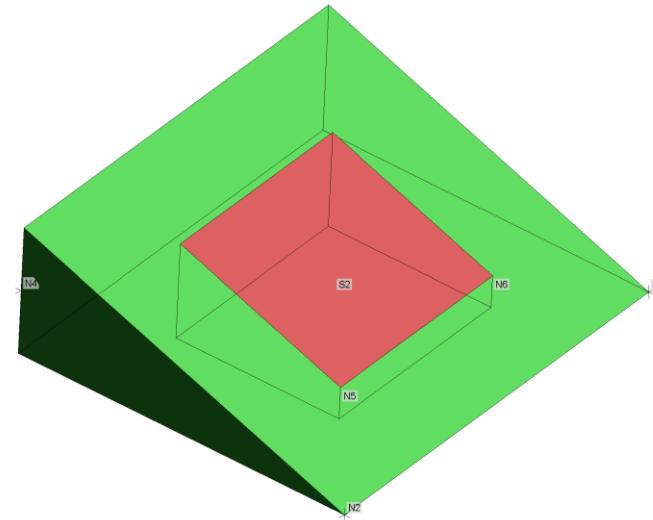
Using old method:

Preferences

Oasys LS-DYNA Environment
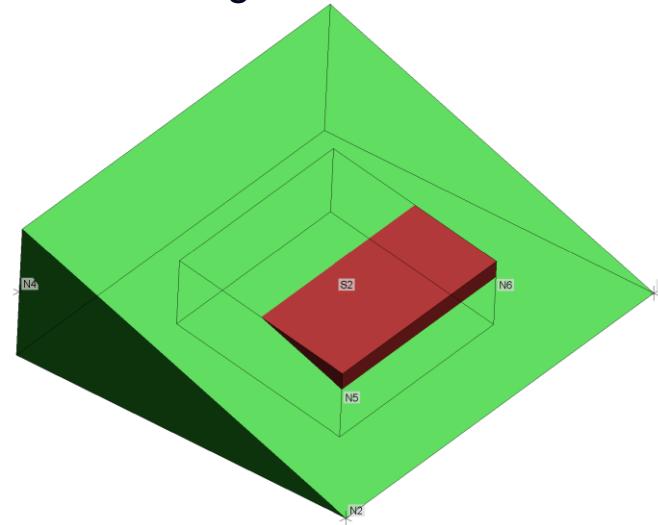
New preferences

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

Oasys LS-DYNA Environment

New preferences

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

New preferences

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

Oasys ∴ LS-DYNA Environment

New preferences

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

New preferences

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

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New preferences

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

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New preferences

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

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