

# Oasys PRIMER: Spotwelding and Connections

Training course

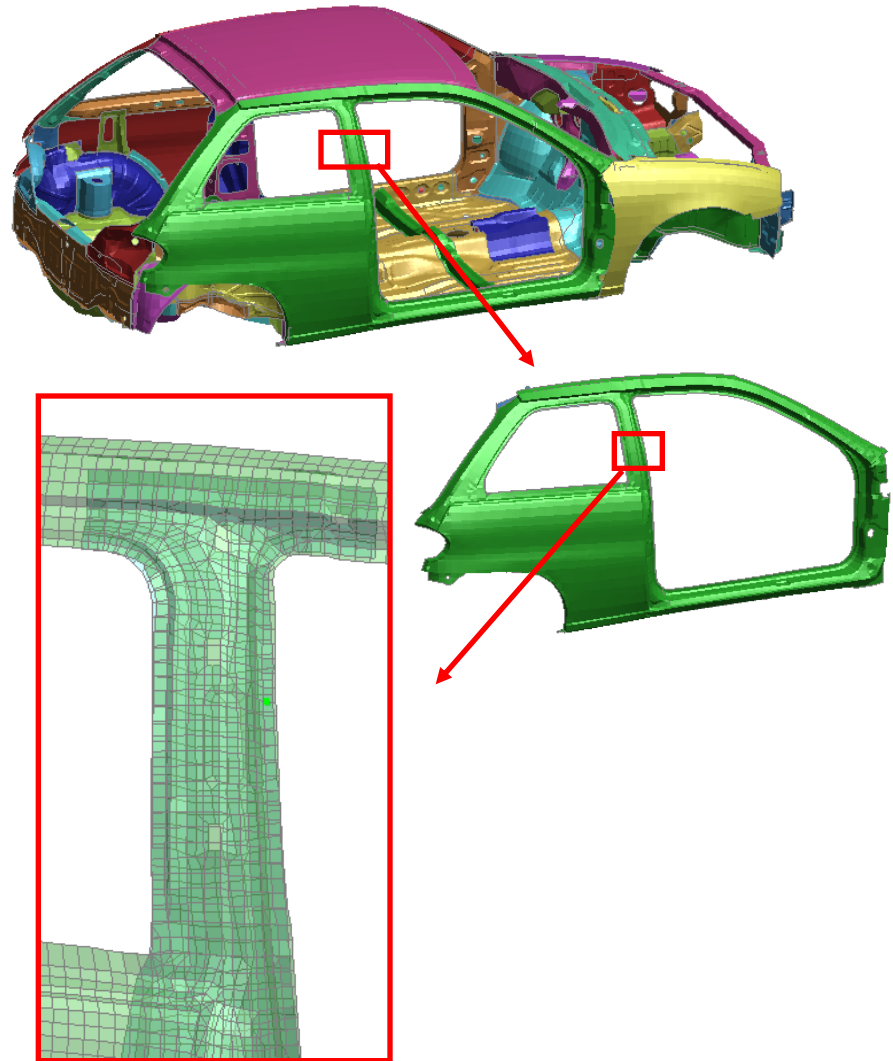
## Objective

- Learn how to create, modify and check spotwelds in Primer10

## Course Contents

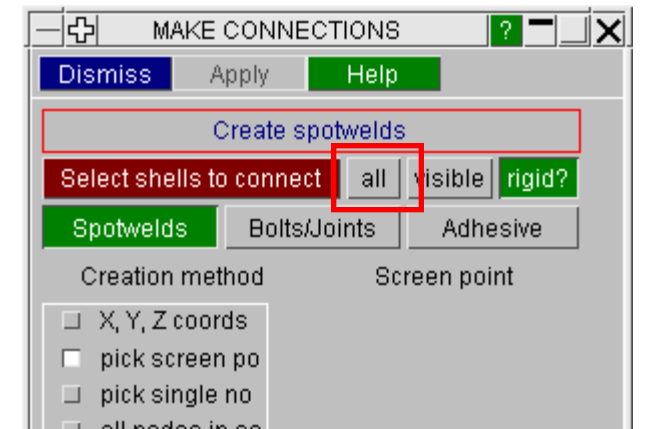
- Creating individual spotwelds
- Autoweld
- Using spotweld files, fixing bad welds
- Using the Connections Table
- Checking spotwelds
- Creating bolts
- Using connections files for bolts
- Creating connection data from existing FE models
- Creating Adhesive

- Read in biw\_for\_welding.key
- Right-mouse-drag across right-hand upper B-post parts, “Only”.
- Make these parts 50% transparent (e.g. right-mouse-drag across=>transparency=>50%)
- Zoom in on the right-hand upper B-post: we will start by creating spotwelds on the forward flange.
- Switch on the element borders (shortcut “Y”)



# Creating spotwelds

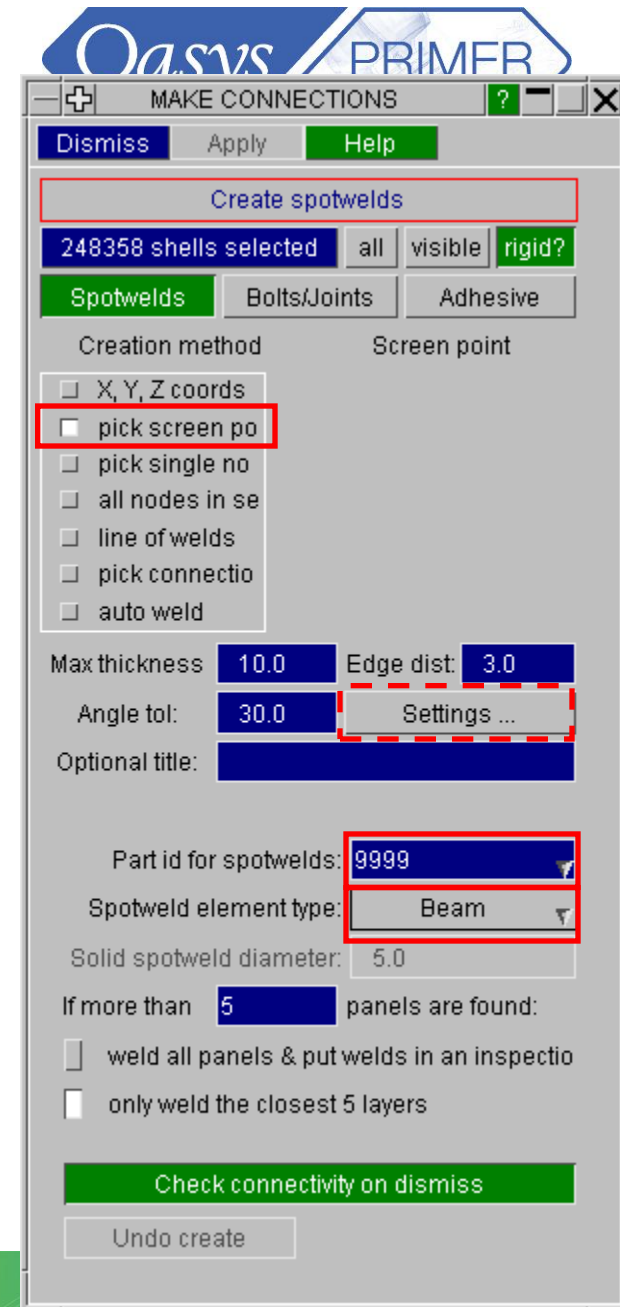
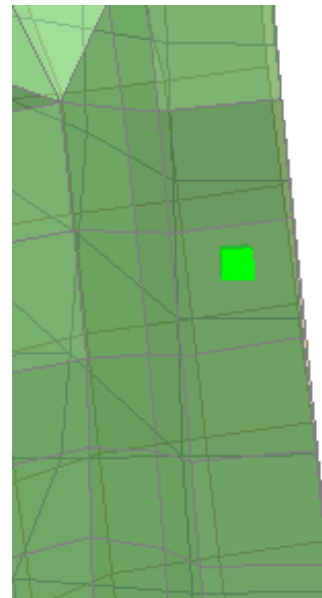
- Tools=>Connection=>Create
- The Connections menu is used for spotwelds and other connection types
- First we have to tell Primer which panels can be considered for welding. This model consists only of body panels so we can just select all the shell-element parts in the model.
- Press “all”.
- Note we could also select only “visible” shells, or explicitly select shells using “Select shells to connect”.



# Creating spotwelds

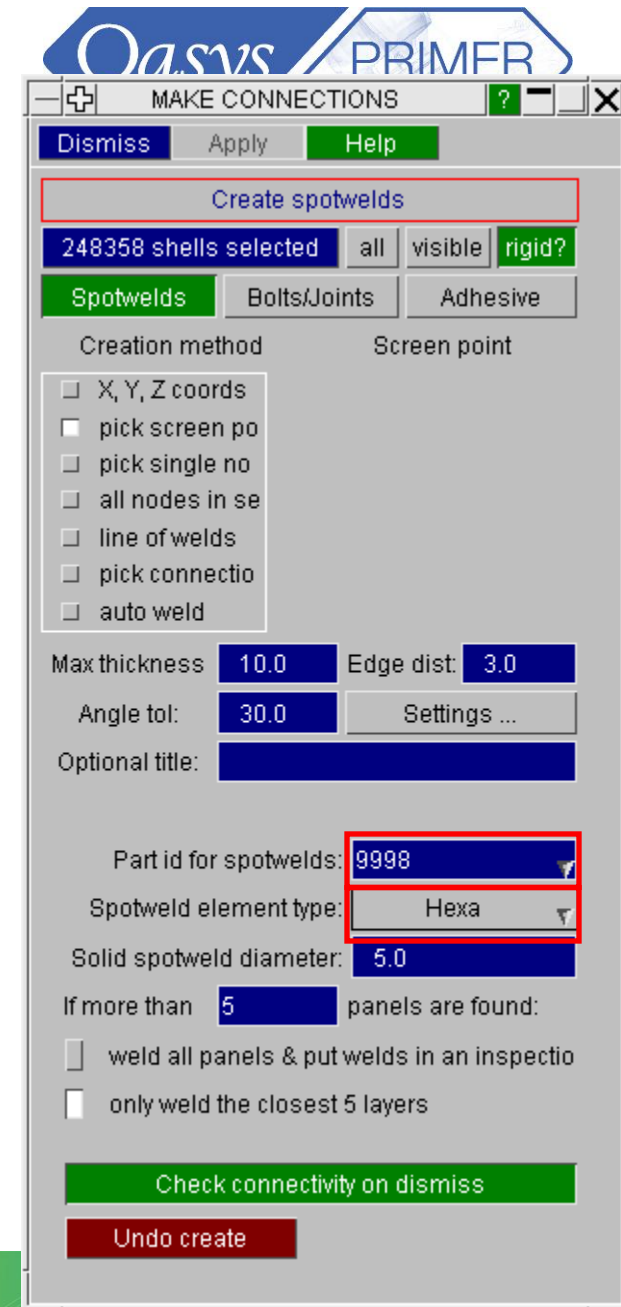
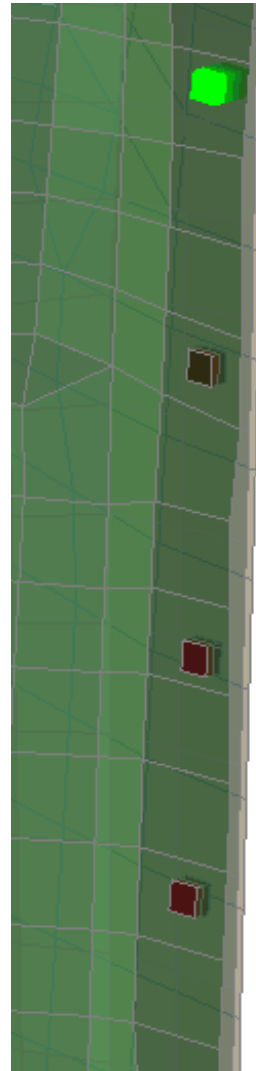
- Leave the spotweld type set to Beam.
- This model already contains an empty Part ID for the beam spotwelds (**ELFORM=9, \*MAT\_SPOTWELD**). Primer automatically finds this and uses it. If this part were not present in the model, you would have to create one first before creating the spotwelds.
- Try the “pick screen point” option.
- Click on a point on the forward flange of the lower B-post.
- A green spotweld appears.
- Rotate the view: Primer found 3 layers to be welded, so it created a chain of 2 beams.

**Note:** You may need to adjust the spotweld Max Length in the Settings window.



# Creating spotwelds

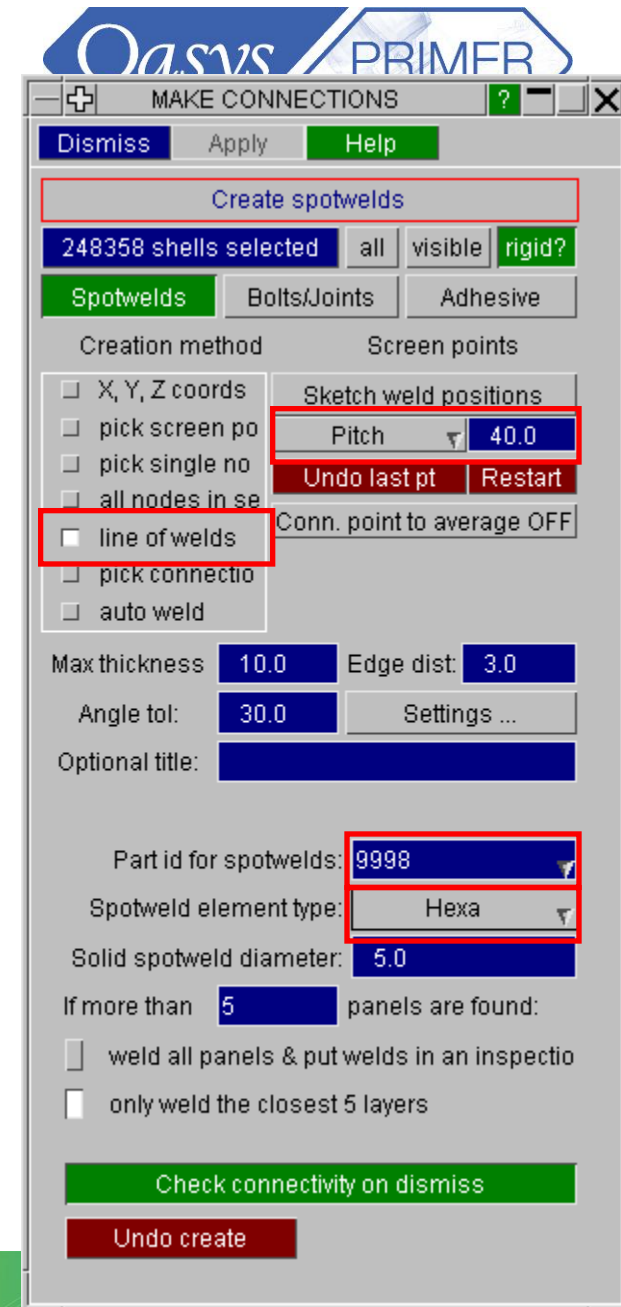
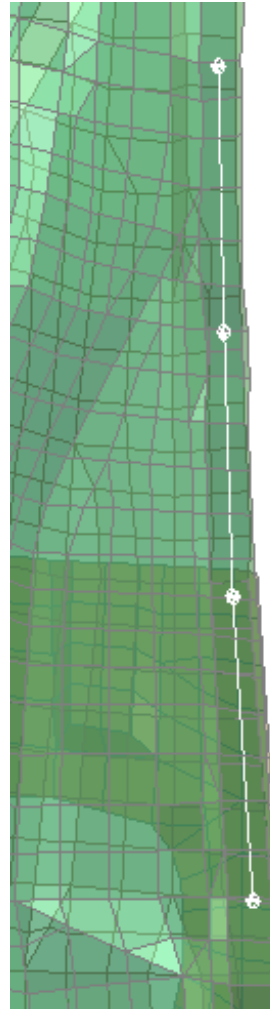
- Switch the element type to Hexa.
- Again, a suitable part is already present in the model so Primer uses it.
- Click on the flange in several places: a solid spotweld appears in each place.
- Also try 4-Hexa.





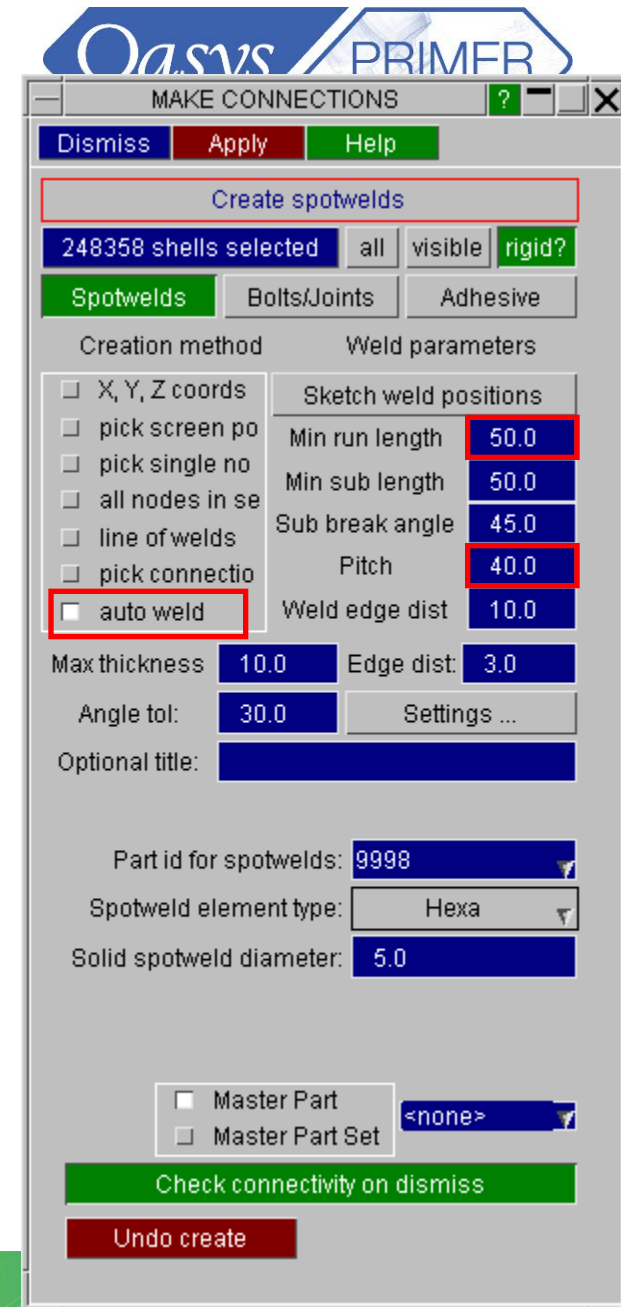
# Creating spotwelds

- Change to Line of Welds.
- Change spacing option to Pitch, set a pitch of 40mm.
- Switch element type back to Hexa.
- Form a segmented line on which the welds will be placed, by clicking points as shown.
- Press “sketch weld positions” to see where Primer will put the welds.
- Press Apply.



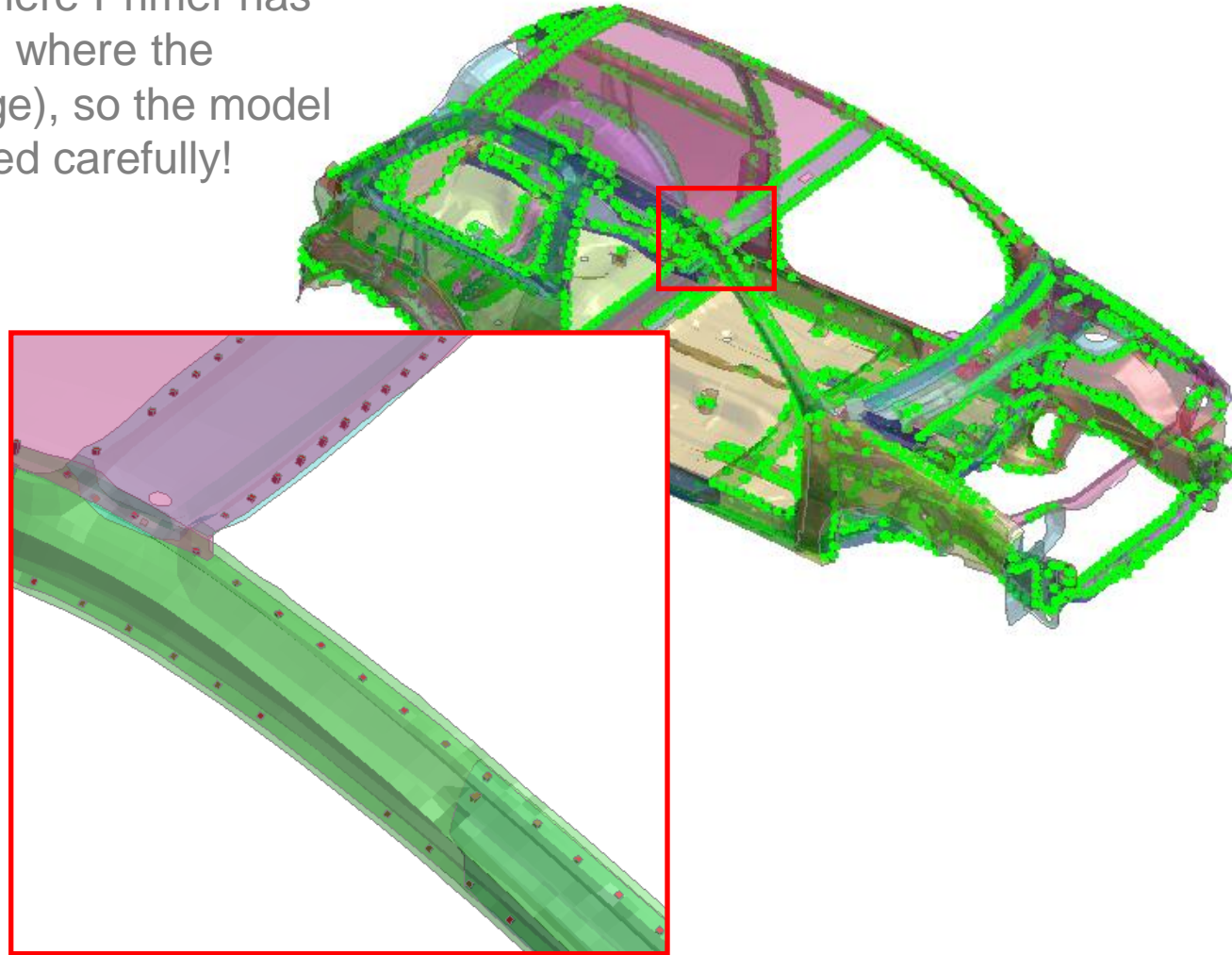
# Autoweld

- Switch the creation method to Autoweld. With this option, Primer tries to create welds at a user-defined pitch, using the free edges of the panels as a guide.
- This option is used when no information is available about the actual locations of the spotwelds.
- Set the “min run length” to 50, i.e. Primer will try to spotweld any flange longer than 50mm.
- Check that the weld pitch is 40mm.
- Unblank all parts (shortcut “U”)
- Press Apply.



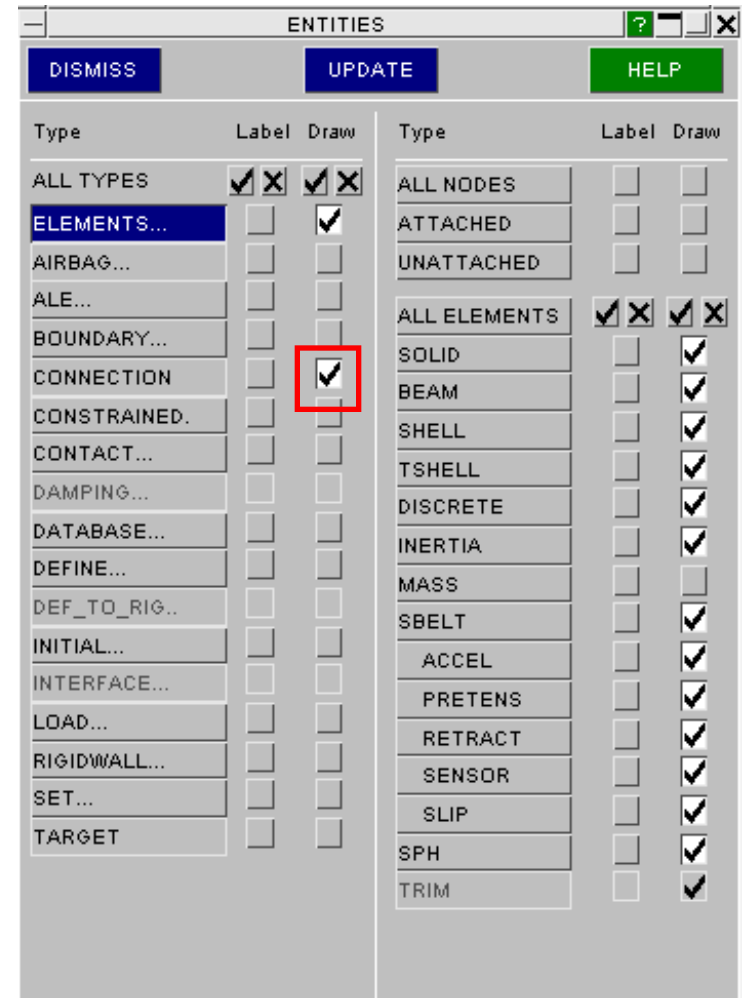


- There will be places where Primer has not created welds (e.g. where the panel gaps are too large), so the model still needs to be checked carefully!



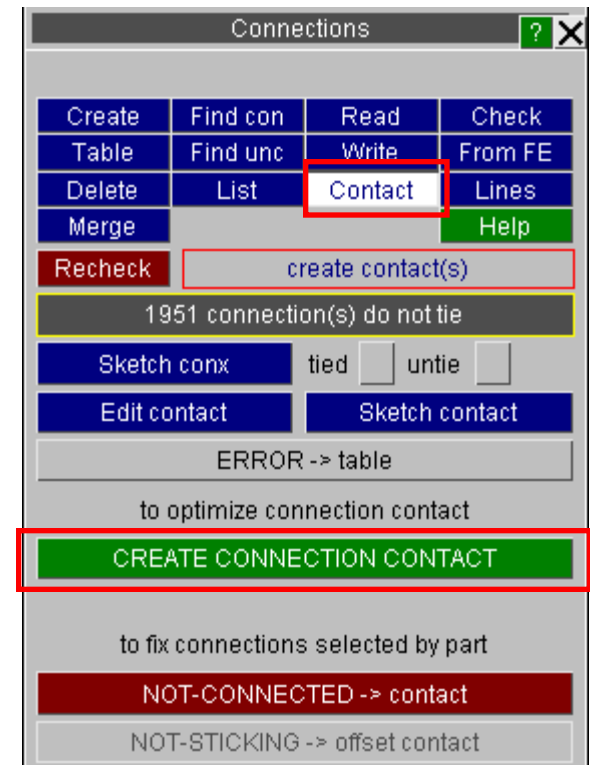
# Creating spotwelds

- When creating spotwelds, Primer also creates connection entities. These are the green circles. If you wish, visibility of these can be switched off using the Entities panel.
- This entity visibility switch will automatically be switched on whenever new spotwelds are created.



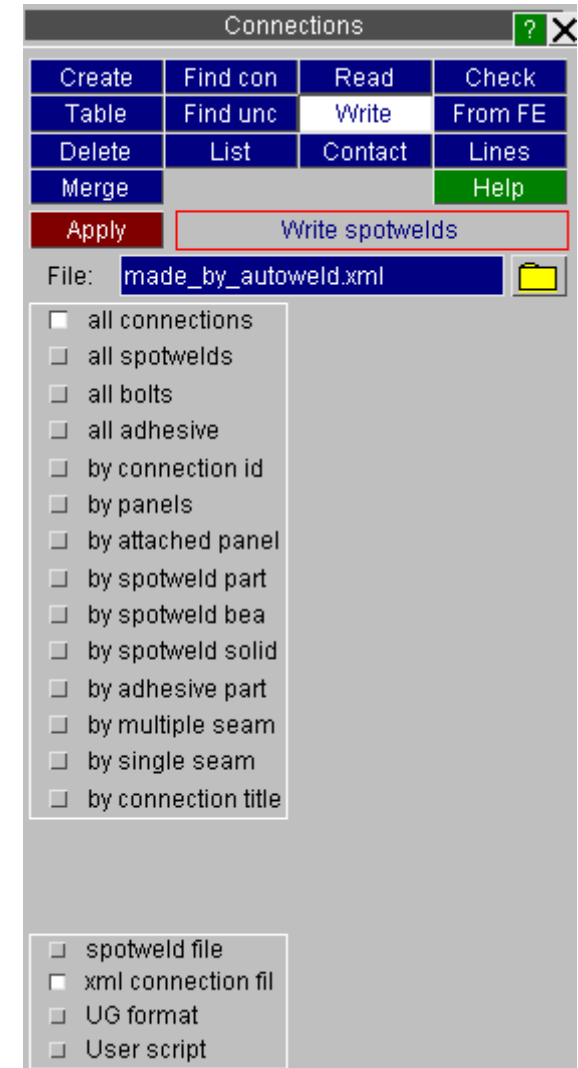
# Adding a tied contact

- After creating spotwelds, we need to create a tied contact to stick them to the panels.
- When you Dismiss the Spotweld Create menu, Primer reminds you to do this.
- Press “Contact”, “Create connection contact”.
- Click on “Two contacts” in the pop-up.
- Primer creates a  
\*CONTACT\_TIED\_SURFACE\_TO\_SURFACE  
for solid elements, or a \*CONTACT\_SPOTWELD  
for beam elements
- If rigid parts or Nodal Rigid Bodies are present, two tied contacts are created - Primer also creates an \_OFFSET (penalty-method) tied contact to stick the spotwelds affected by rigid entities.



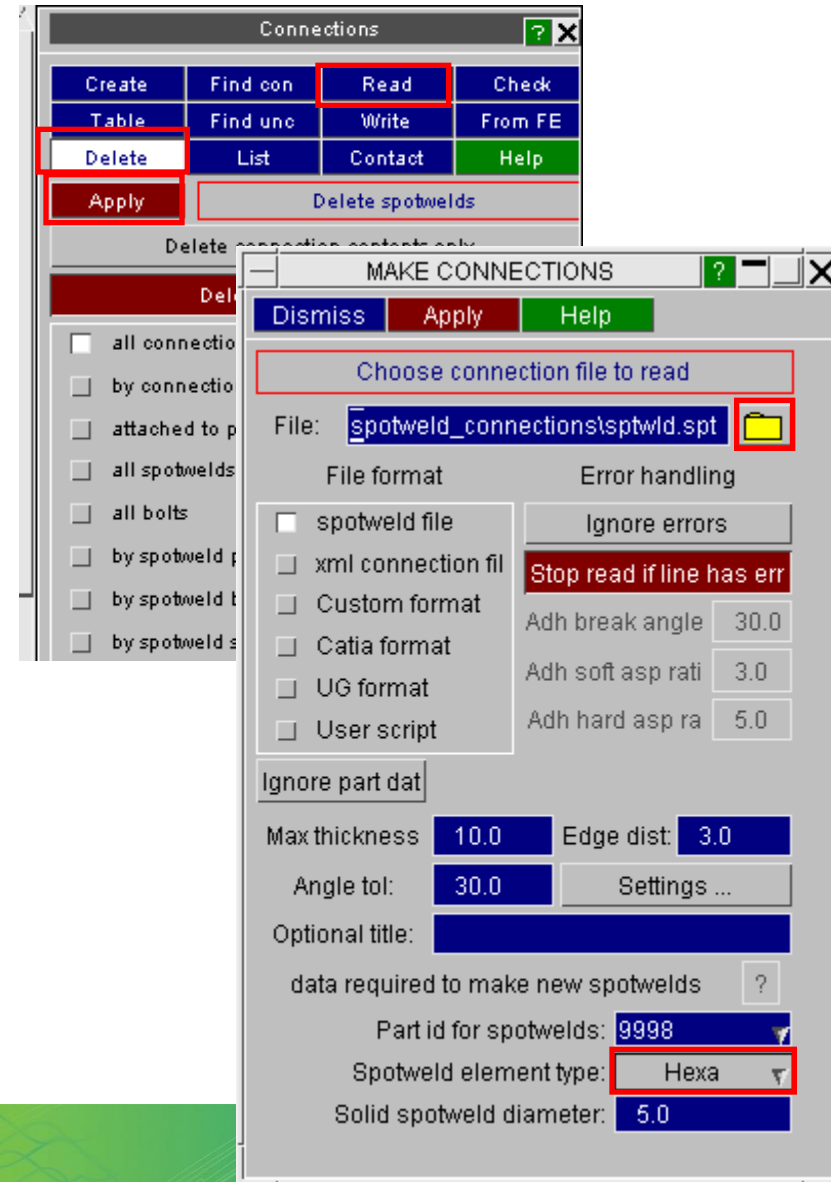
# Writing a spotweld file

- Dismiss the Spotweld Create menu (e.g. press ESC while the mouse is in that menu).
- To save the newly created spotwelds, we should either write out a keyword file, or write a spotweld file. The spotweld file contains the coordinates of each spotweld, and which panels are connected. The same spotwelds could be re-created in another similar model from the spotweld file.
- “Primer spotweld file” = simple csv format, one line per weld.
- “XML connection file” = xml-format, contains more information e.g. whether the welds are beam or hexa.
- Unigraphics (UG) format weld file is also available.
- We would recommend to choose a XML Connection file, to avoid losing any information.
- Write a connections file named example1.xml.



# Reading a spotweld file

- Before reading the spotweld file, we will delete all the existing spotwelds.
- Press Delete, leave the selector on “All connections”, Apply.
- Click “Delete CONX & FE” in the pop-up.
- Press Read, set the file format to “Spotweld File”.
- Browse to find the file sptwld.spt
- Check that the spotweld element type is set to Hexa
- Press Apply





# Reading a spotweld file

- An image of the file contents appears
- “Primer spotweld file” format can be used for files written by other software – the meaning of each column may be controlled from the drop-down menus. The limitation is that the file must have only one line per spotweld.
- Move the menu so you can see the vehicle.
- Press Apply.

MAKE CONNECTIONS

CANCEL

Drop the yellow... field widths. Columns for the X, Y and Z coordinates must be chosen. Part ID and weld ID c

Column 1

Field

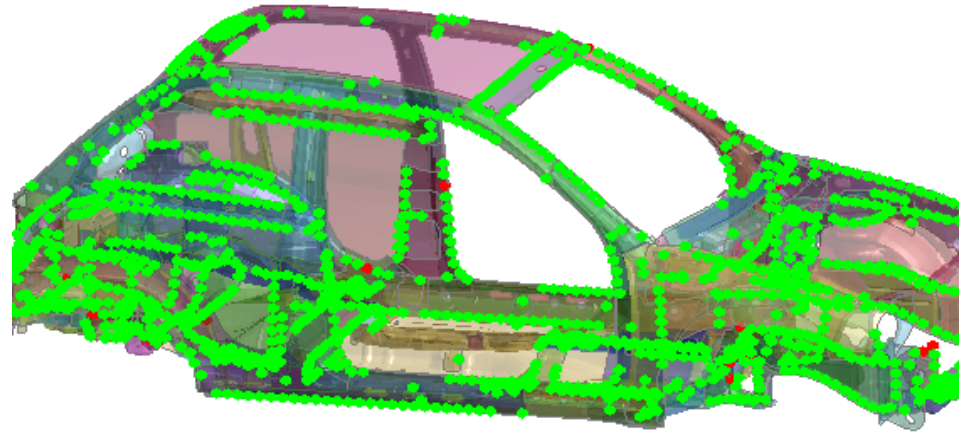
Drop-down menu to change meaning of column of data

Field	Skip field	Weld ID	Skip field	X coord	Y coord	Z coord	Skip field	Part ID	Part ID	Part ID
SPOTWELD	1	POINT	-1438.2809	649.83295	355.80676	PARTS	10000043	10000000	10000037	
SPOTWELD	2	POINT	-1399.597	650.64423	365.72354	PARTS	10000043	10000000	10000002	
SPOTWELD	3	POINT	-1367.7036	650.31738	389.37738	PARTS	10000001	10000002		



# Reading a spotweld file

- Primer creates the spotwelds (green symbols) where possible. Bad welds are shown in red.
- A message appears stating how many spotwelds were successfully created, and how many were not. Press Continue.
- Most spotweld files contain some errors. Fixing the errors can be a time-consuming task. Primer automatically puts the bad welds into the Connection Table.
- We will now use the table to fix some of the errors.



CONNECTION TABLE								
Dismiss View... Options... Refresh			Action: update & remake			Show all		
Apply: Undo All Selected Changed			Autoscale			Clear Sel all Select Show sel		
ID	Type	Subtype	Part ID	Diameter	Max length	Layer 1	Layer 2	
3	SPOTWEL	Solid	9998	5	n/a	P1000000	P1000000	
4	SPOTWEL	Solid	9998	5	n/a	P1000000	P1000000	
18	SPOTWEL	Solid	9998	5	n/a	P1000000	P1000000	
19	SPOTWEL	Solid	9998	5	n/a	P1000000	P1000000	
20	SPOTWEL	Solid	9998	5	n/a	P1000000	P1000000	
71	SPOTWEL	Solid	9998	5	n/a	P1000004	P1000000	
74	SPOTWEL	Solid	9998	5	n/a	P1000004	P1000000	
75	SPOTWEL	Solid	9998	5	n/a	P1000004	P1000000	
78	SPOTWEL	Solid	9998	5	n/a	P1000004	P1000000	
266	SPOTWEL	Solid	9998	5	n/a	P1000001	P1000003	
371	SPOTWEL	Solid	9998	5	n/a	P1000002	P1000003	
475	SPOTWEL	Solid	9998	5	n/a	P1000004	P1000003	

- Try hovering over some of the text in the “error” and “details” columns.
- Try sorting the table by clicking on the column headers.
- Go back to sorting by ID (left-hand column).
- Select the first five welds (click and shift-click), right-click “Show conx and panels”.

CONNECTION TABLE

Dismiss View... Options... Refresh Action: update & remake Show all ?

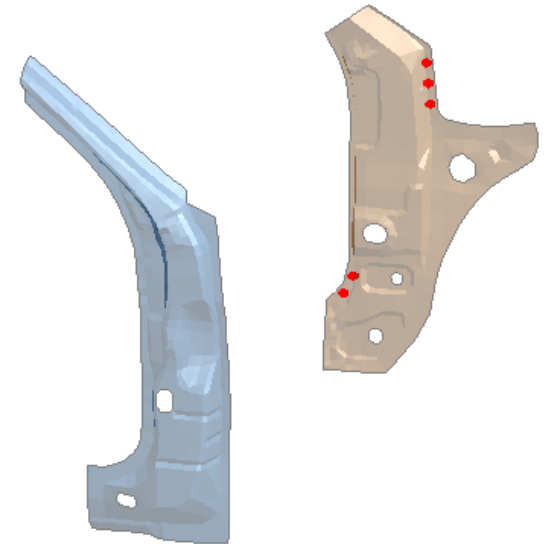
Apply: Undo All Selected Changed Autoscale Clear Sel all Select Show sel

ID	Type	Subtype	Part ID	Diameter	Max length	Layer 1	Layer 2	Layer 3	Status	Error	Details
3	SPOTWEL	Solid	9998	5	n/a	P10			Bad	Some p	Only one lay
4	SPOTWEL	Solid	9998	5	n/a	P10			Bad	Some p	Only one lay
18	SPOTWEL	Solid	9998	5	n/a	P10			Bad	Some p	Only one lay
19	SPOTWEL	Solid	9998	5	n/a	P10			Bad	All pairs	None
20	SPOTWEL	Solid	9998	5	n/a	P10			Bad	Some p	Only one lay
71	SPOTWEL	Solid	9998	5	n/a	P10		P10000070	Bad	Some p	layer 1 is not
74	SPOTWEL	Solid	9998	5	n/a	P10			Bad	Some p	Only one lay
75	SPOTWEL	Solid	9998	5	n/a	P10			Bad	Couldn't	1 possible p
78	SPOTWEL	Solid	9998	5	n/a	P10		P10000004	Bad	Inconsi	Inconsistent
266	SPOTWEL	Solid	9998	5	n/a	P10			Bad	Couldn't	1 possible p

Change Layer 1  
Update & remake  
Sketch conx  
Show conx & panels  
Empty conx  
Upd & remake (repos  
Select PID  
More...  
Change to...  
Sketch layer  
Delete layer

# Fixing errors

- The selected connections, and the panels referred to, are displayed.
- The error is clear – the right-hand A-post has been referenced instead of the left-hand one.
- Right-click on the data in Layer 1 (P10000001), drop down to “Select PID”, select part 10000000 (the first part in the list).



CONNECTION TABLE											
Dismiss View... Options... Refresh			Action: update & remake			Show all					
Apply: Undo All Selected Changed			Autoscale			Clear Sel all Select		Show sel			
ID	Type	Subtype	Part ID	Diameter	Max length	Layer 1	Layer 2	Layer 3	Status	Error	Details
3	SPOTWEL	Solid	9998	5	n/a	P10			Bad	Some p	Only one lay
4	SPOTWEL	Solid	9998	5	n/a	P10			Bad	Some p	Only one lay
18	SPOTWEL	Solid	9998	5	n/a	P10			Bad	Some p	Only one lay
19	SPOTWEL	Solid	9998	5	n/a	P10			Bad	All pairs	None
20	SPOTWEL	Solid	9998	5	n/a	P10			Bad	Some p	Only one lay
71	SPOTWEL	Solid	9998	5	n/a	P10		P10000070	Bad	Some p	layer 1 is not
74	SPOTWEL	Solid	9998	5	n/a	P10			Bad	Some p	Only one lay
75	SPOTWEL	Solid	9998	5	n/a	P10			Bad	Couldn't	1 possible p
78	SPOTWEL	Solid	9998	5	n/a	P10		P10000004	Bad	Inconsi	Inconsistent
266	SPOTWEL	Solid	9998	5	n/a	P10			Bad	Couldn't	1 possible p

Change Layer 1

Update & remake

Sketch conx

Show conx & panels

Empty conx

Upd & remake (repos

Select PID

More...

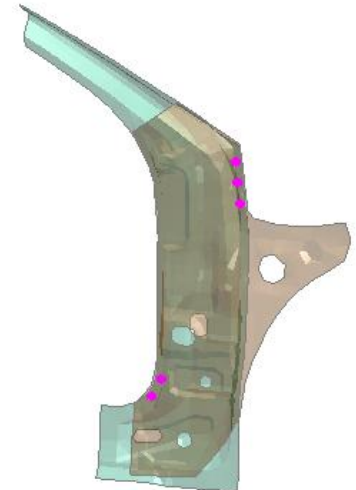
Change to...

Sketch layer

Delete layer

# Fixing errors

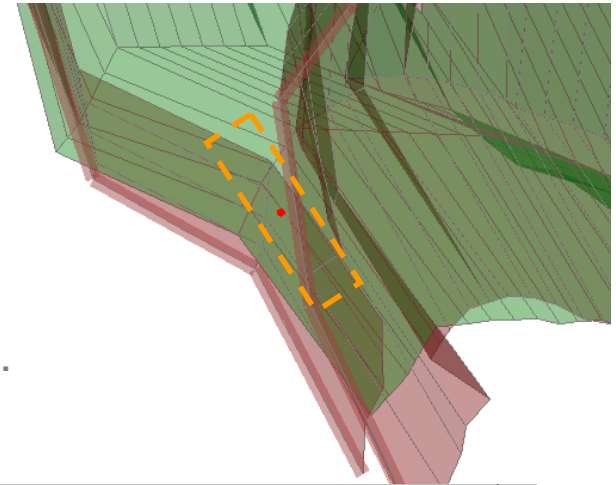
- The revised data is shown in red.
- To update the connection data and remake the weld, right-click and “update & remake”
- Again, request “show conx and panels”. Check that the correct panels are now shown.
- Do not worry about the “NOT CONNECTED” error that now appears – this is because we have not yet created the tied contact.



CONNECTION TABLE											
Dismiss View... Options... Refresh			Action: update & remake			Show all					
Apply: Undo All Selected Changed			Autoscale			Clear Sel all Select		Show sel			
ID	Type	Subtype	Part ID	Diameter	Max length	Layer 1	Layer 2	Layer 3	Status	Error	Details
3	SPOTWEL	Solid	9998	5	n/a	P10000000	P10000000		Unche	Some p	Only one lay
4	SPOTWEL	Solid	9998	5	n/a	P10000000	P10000000		Unche	Some p	Only one lay
18	SPOTWEL	Solid	9998	5	n/a	P10000000	P10000000		Unche	Some p	Only one lay
19	SPOTWEL	Solid	9998	5	n/a	P10000000	P10000000		Unche	All pairs	None
20	SPOTWEL	Solid	9998	5	n/a	P10000000	P10000000		Unche	Some p	Only one lay
71	SPOTWEL	Solid	9998	5	n/a	P10000000		10000070	Bad	Some p	layer 1 is not
74	SPOTWEL	Solid	9998	5	n/a	P10000000			Bad	Some p	Only one lay
75	SPOTWEL	Solid	9998	5	n/a	P10000000			Bad	Couldn't	1 possible p
78	SPOTWEL	Solid	9998	5	n/a	P10000000		10000004	Bad	Inconsi	Inconsistent
266	SPOTWEL	Solid	9998	5	n/a	P10000000			Bad	Couldn't	1 possible p

# Fixing errors

- Click on weld 71, “show conx and panels”.
- Primer could not create a hexa weld, because the element would have been warped. The position of the connection is too near a fold-line, it needs to be moved.
- To do this, use “View” to add columns for X Y and Z.
- Right-click on the X-coordinate, “Pick (from shell)”

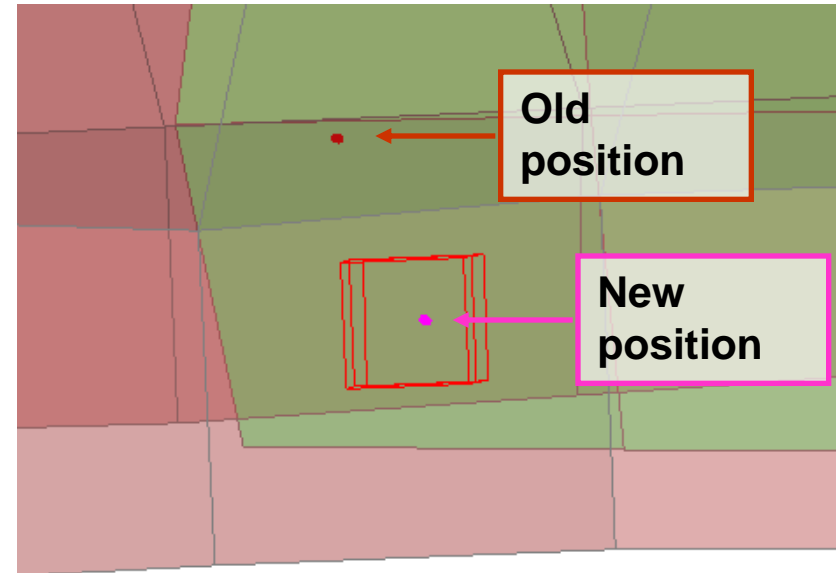


CONNECTION TABLE												
Dismiss View... Options... Refresh			Action: update & remake			Show all						
Apply: Undo All Selected Changed			Autoscale			Clear Sel all Select			Show sel			
ID	Part ID	Diameter	Layer 1	Layer 2	Layer 3	Status	Error	Details	X	Y	Z	
3	9998	5	P10000000	P10000002		Invalid	NOT CON	nodes/s	-1367.7	650.317	389.377	
4	9998	5	P10000000	P10000002		Invalid	NOT CON	nodes/s	-1348.51	650.948	423.935	
18	9998	5	P10000000	P10000002		Invalid	NOT CON	nodes/s	-1195.26	671.652	846.361	
19	9998	5	P10000000	P10000002		Invalid	NOT CON	nodes/s	-1193.13	672.22	806.119	
20	9998	5	P10000000	P10000002		Invalid	NOT CON	nodes/s	-1190.35	673.404	764.707	
71	9998	5	P10000043	P10000004	P10000070	Bad	Some pan	layer 1 is	-1967.75	512.68	1261.78	
74	9998	5	P10000043	P10000004		Bad	Some pan	Only one	-178		92.67	
75	9998	5	P10000043	P10000004		Bad	Couldn't m	1 possib	-174		75.15	
78	9998	5	P10000043	P10000000	P10000004	Bad	Inconsiste	Inconsis	-158		73.98	
266	9998	5	P10000018	P10000037		Bad	Couldn't m	1 possib	-174		8.913	

- Change X
- Update & remake
- Sketch conx
- Show conx & panels
- Empty conx
- Upd & remake (repos)
- Pick (from node)
- Pick (from shell)



- Adjust the view so you can see the flanges clearly.
- Click on a new position nearer the middle of the flange and further from the edge of the green panel.
- The new position appears as a black dot.
- Right click and “Update & remake”

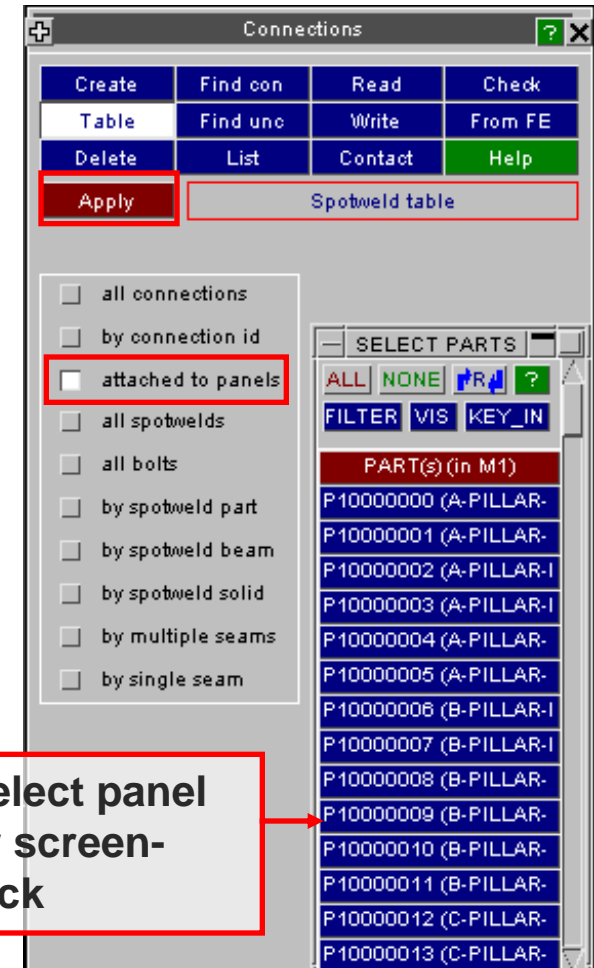
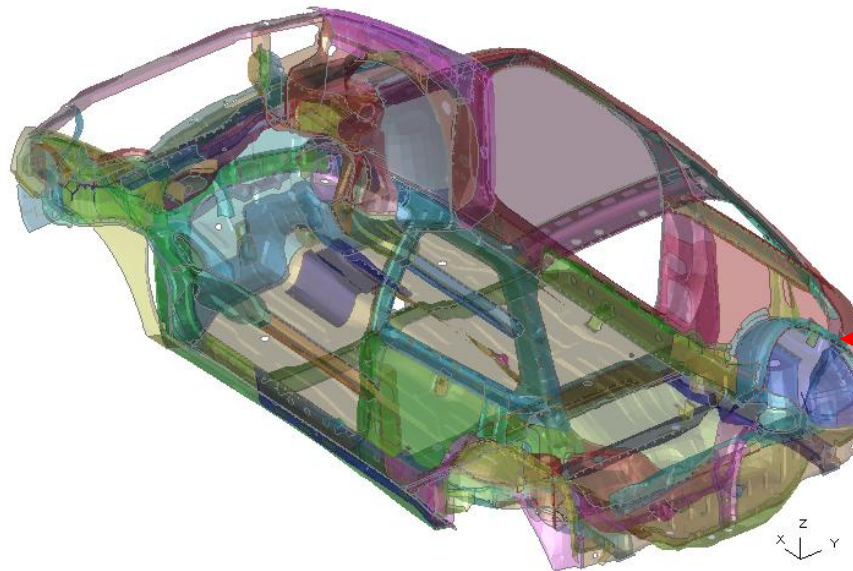




- Scroll through the remaining welds. Weld ID 1139 to 1142 reference non-existent panel PIDs. Use the action “delete connection” to remove these:
  - Change action at top of menu to “delete connection”
  - Next to “All”, press “Selected”.
  - Chose “Delete FE”
- We could continue to fix the bad welds using these methods.
- Dismiss the table.
- Use the Connections=>Contact tool to create the tied contact.
- Write a connections file and/or a keyword file to save the corrected data.

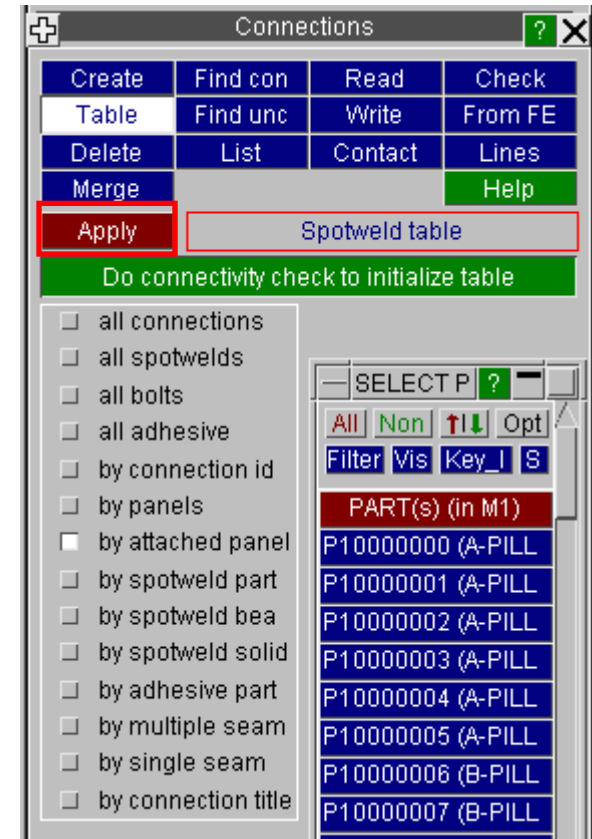
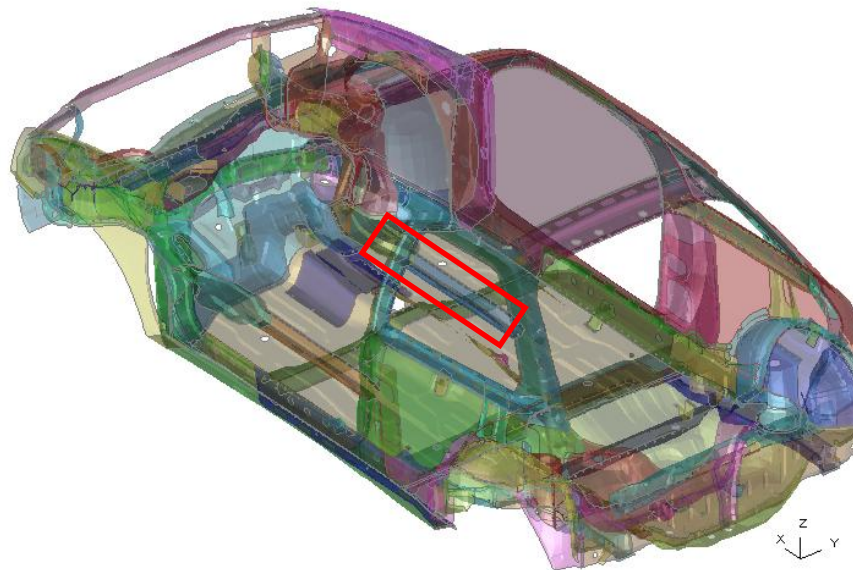
# Reprojecting welds

- If the panel geometry is modified, the spotweld elements may no longer be coincident with the panel element planes. The spotwelds need to be reprojected.
- To do this, you would select the spotwelds attached to the modified panel to be opened in the Table, Select all welds in the table, update & remake. (Do not do this now)

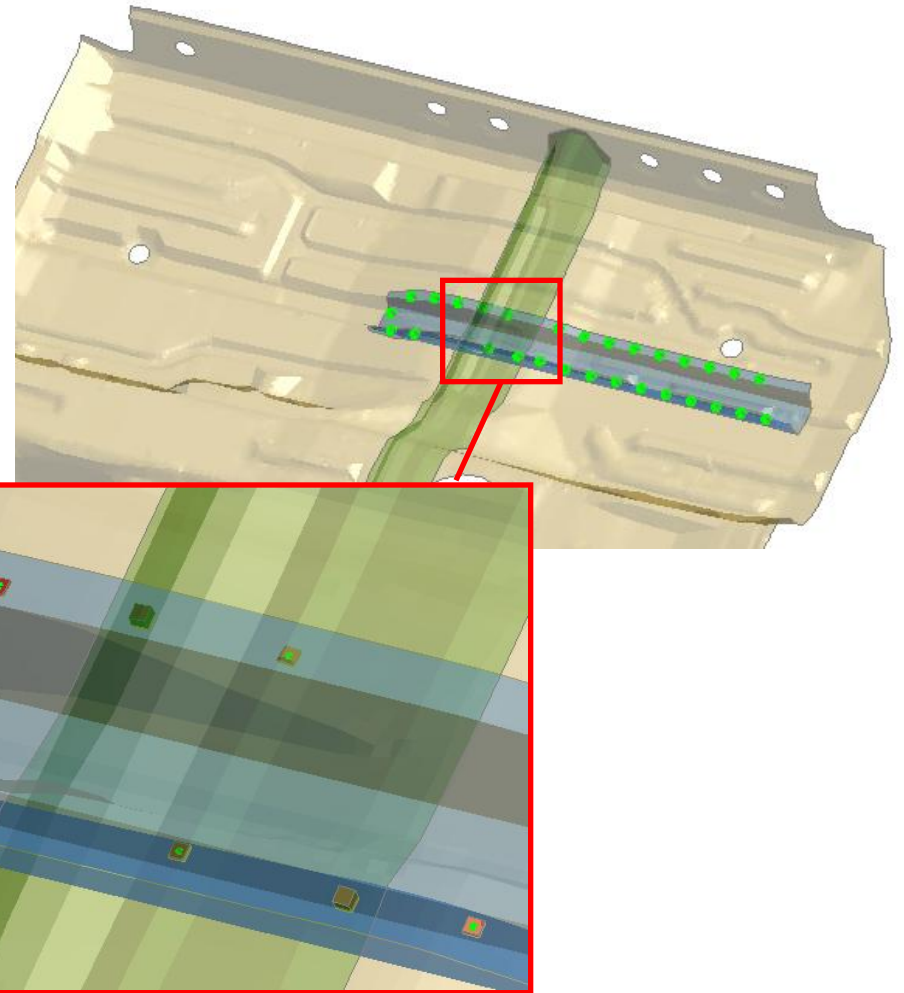


# Other uses of the connections table

- The table can be used to check or modify a subset of the spotwelds, e.g. those connected to a particular panel.
- Set the selector option to “by attached panels”, press VIS, and pick the blue underfloor longitudinal.
- Press Apply



- Primer puts only those welds connected to the selected panel into the table.
- By setting the action to “show connection and panels”, selecting all the welds in the table, and pressing “apply selected”, you can check for missing welds.





# Changing spotweld type

- We will now change the type of elements used for these spotwelds.
- Using View, add Type and Subtype. Un-check the columns for X, Y and Z.
- Leave all the welds in the table selected.
- Right-click on the column for subtype, choose 4 solids, and update & remake the spotwelds. Inspect the welds created.
- This method can also be used to change between beam and solid element spotwelds, provided that the model already contains a suitable Part ID.

ID	Type	Subtype	Part ID	Diameter	Layer 1	Layer 2	Layer 3	Status	Error	Details
251	SPOTWELD	4 solids	9998	5	P10000018	P10000037	P10000053	Invalid	NOT TIED - Con	Connection node
1201	SPOTWELD	4 solids		5	P10000037	P10000053		Realized		
1202	SPOTWELD	4 solids		5	P10000037	P10000053		Realized		
1203	SPOTWELD	4 solids		5	P10000037	P10000053		Realized		
1204	SPOTWELD	4 solids		5	P10000037	P10000053		Realized		
1205	SPOTWELD	4 solids		5	P10000037	P10000053		Realized		
1206	SPOTWELD	4 solids		5	P10000037	P10000053		Realized		
1207	SPOTWELD	4 solids		5	P10000037	P10000053		Realized		
1208	SPOTWELD	4 solids		5	P10000037	P10000053		Realized		
1209	SPOTWELD	4 solids		5	P10000037	P10000053		Realized		
1210	SPOTWELD	4 solids		5	P10000037	P10000053		Realized		
1211	SPOTWELD	4 solids		5	P10000018	P10000037	P10000053	Invalid	NOT TIED - Con	Connection node
1212	SPOTWELD	4 solids		5	P10000037	P10000053		Realized		
1213	SPOTWELD	4 solids		5	P10000037	P10000053		Realized		

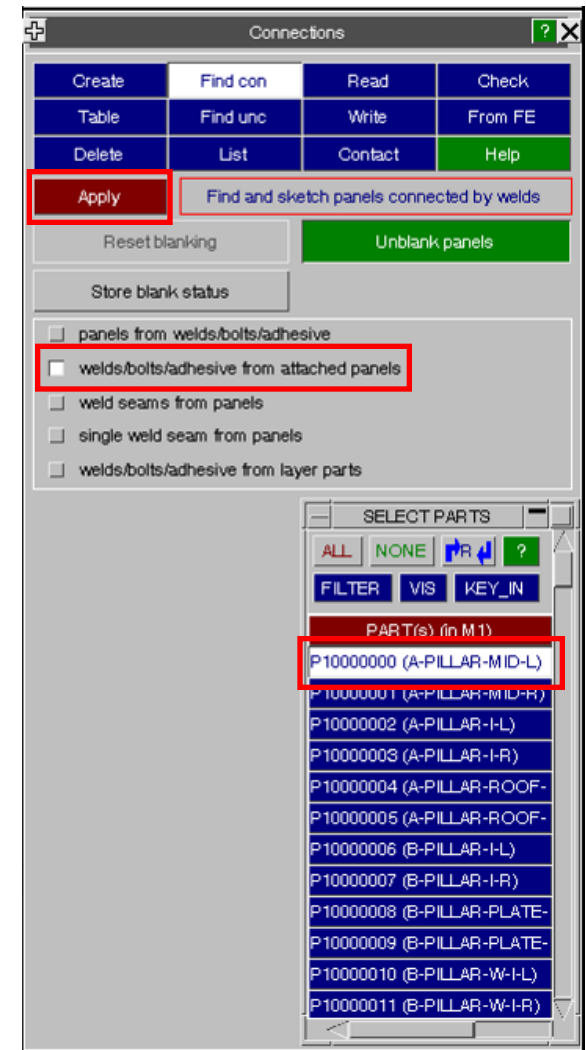
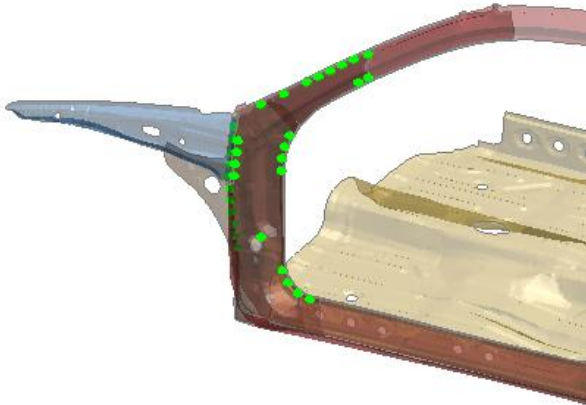
- Sometimes it is advantageous to describe the layers that connect to each spotweld in a more general way than Part ID. For example, a taylor-welded blank may consist of several parts. The Table permits description of layers by a list of parts, by part set, etc.

CONNECTION TABLE										
<div> Dismiss View... Options... Refresh Action: show connection and panels Autosca </div>										
<div> Table Changes: Undo Apply selected Apply all Apply changed Select all </div>										
ID	Diameter	Part ID	Status	Error	Details	Layer 1	Layer 2	Layer 3	Type	Subtype
1219	5	9998	Realized			P10000037	P10000053		SPOTWELD	4 solids
1220	5	9998	Realized			P100000			SPOTWELD	4 solids
1221	5	9998	Realized			P100000			SPOTWELD	4 solids
1223	5	9998	Realized			P100000			SPOTWELD	4 solids
1224	5	9998	Realized			P100000			SPOTWELD	4 solids
1225	5	9998	Realized			P100000			SPOTWELD	4 solids
1226	5	9998	Realized			P100000			SPOTWELD	4 solids
1227	5	9998	Realized			P100000			SPOTWELD	4 solids
1228	5	9998	Realized			P10000037	P10000053		SPOTWELD	4 solids
1229	5	9998	Realized			P10000037	P10000053		SPOTWELD	4 solids
1230	5	9998	Realized			P10000037	P10000053		SPOTWELD	4 solids
1231	5	9998	Realized			P10000037	P10000053		SPOTWELD	4 solids
1232	5	9998	Realized			P10000037	P10000053		SPOTWELD	4 solids
1233	5	9998	Realized			P10000037	P10000053		SPOTWELD	4 solids



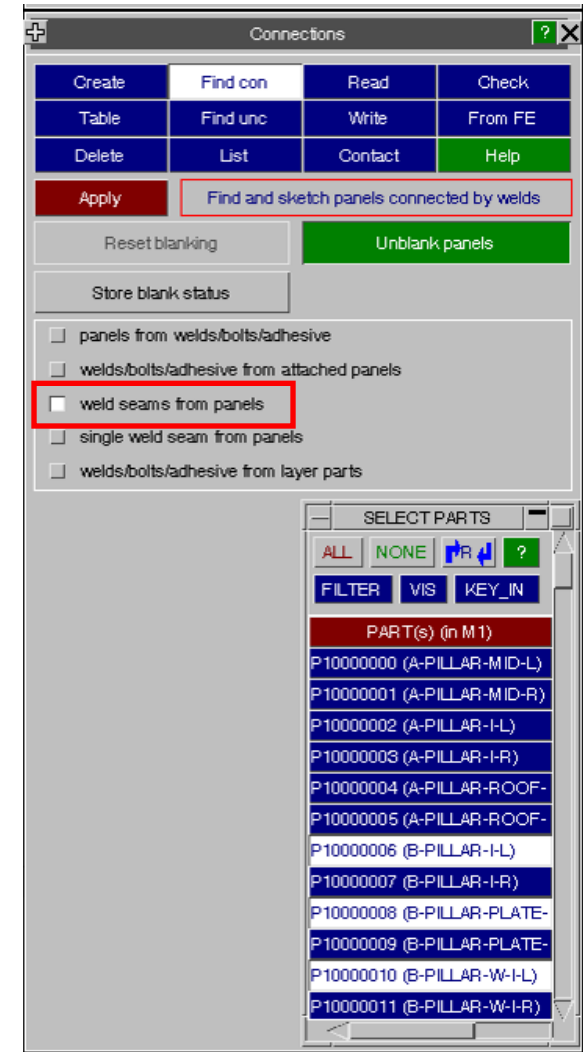
# Checking spotwelds

- Various tools are provided for checking spotwelds.
- “Find Con(nected)” means “show welds and panels”. This allows you to check visually for missing welds.
- Set the selection method to “welds/bolts/adhesive from attached panels”
- Pick the first part in the list, press Apply.
- Primer shows all the welds and panels connected to the selected panel.



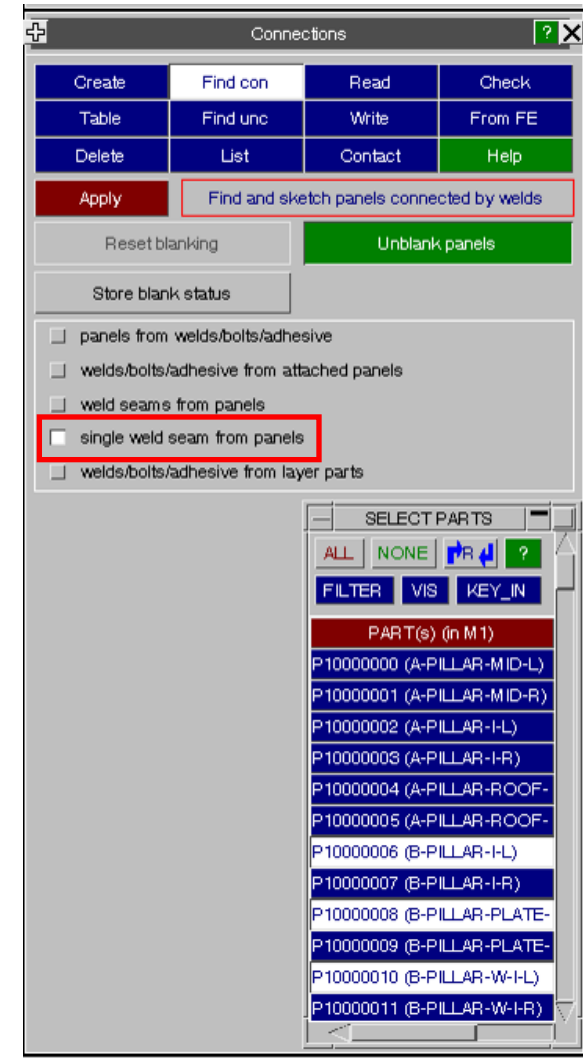
# Checking spotwelds

- Switch to “weld seams from panels”.
- Select parts 10000006 10000008 and 10000010.
- Press Apply.
- This option displays only the selected panels, and any welds that connect any combination of those panels, e.g. 10000006 to 10000008.



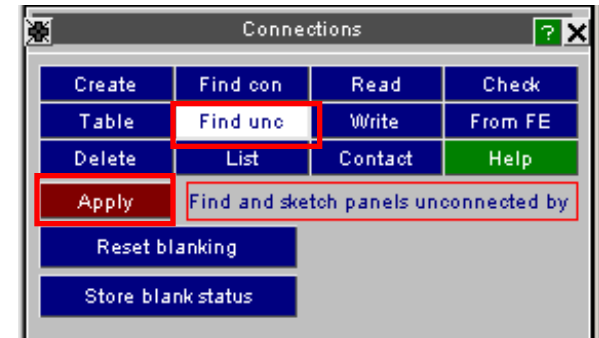
# Checking spotwelds

- Switch to “single seam from panels”.
- Select the same parts, Apply.
- This option displays only spotwelds that connect between all of the selected panels.



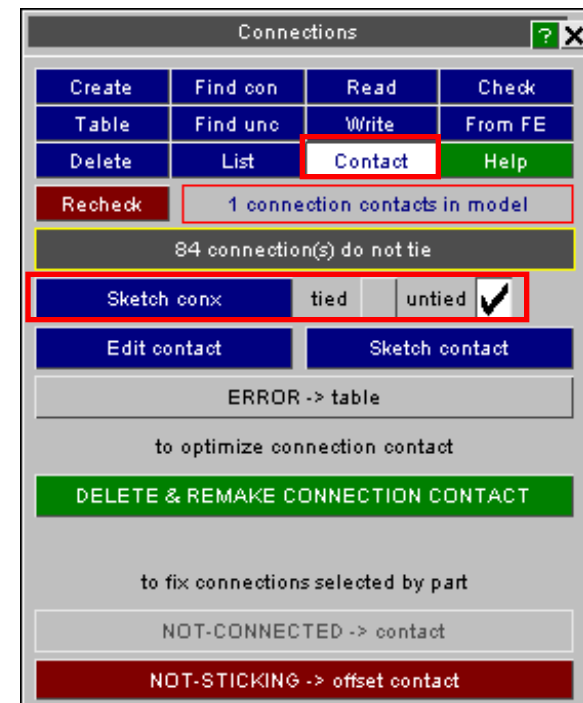
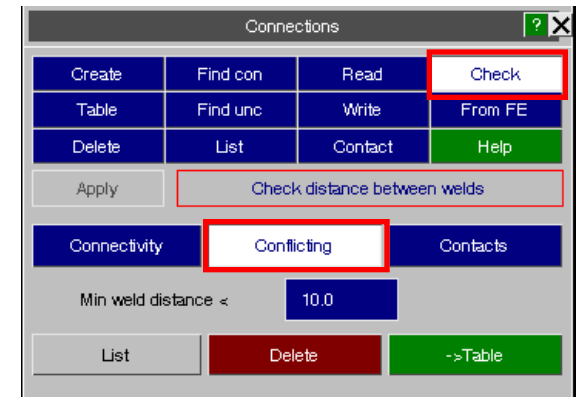
# Checking spotwelds

- Press Find unc(onnected)”
- Primer displays any parts not connected by at least one spotweld



# Checking spotwelds

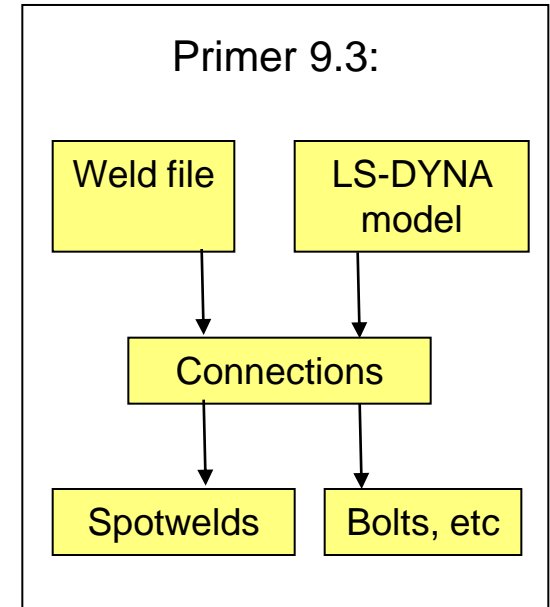
- Press Check
- “Conflicting” – are any pairs of spotwelds too close to each other? Try distance = 20mm. First try “List”, then try “Table”.
- The other two options, “Connectivity” and “Contact”, are now superceded by the main “Contact” menu.
- Try also the Connections=>Contact menu. This is for checking and correcting the tied contact.
- Try changing the material of one of the body panels to rigid, re-check the tied contact.
- Now, some of the spotwelds do not tie, due to constraint clash with constraint-type tied contact. Use the Sketch Conx => untied to view them
- Re-make the tied contact.





- Each spotweld has a corresponding “connection entity”, which stores the instructions for making the connection.
- This method has several advantages:
  - Failed welds are retained in the model, can be fixed any time.
  - When creating from a spotweld file, the original XYZ coords are retained.
  - Easy to change the welds, e.g. beam-to-solid.
- Other connection types are possible: bolts, adhesive.

Primer 9.3:



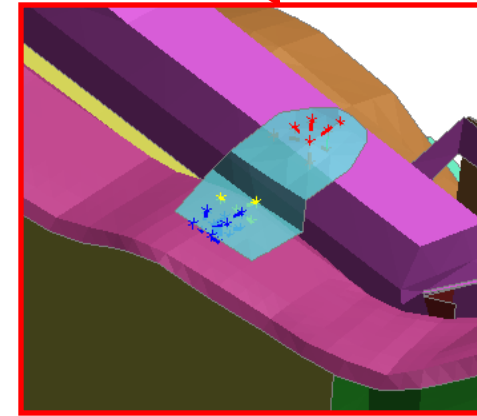
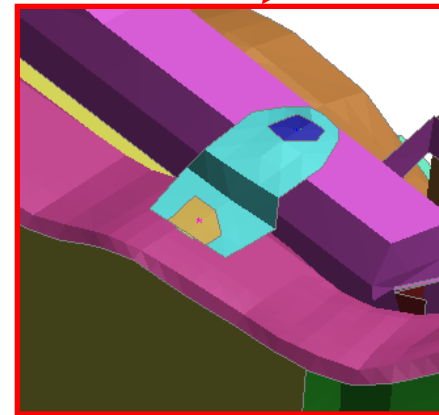
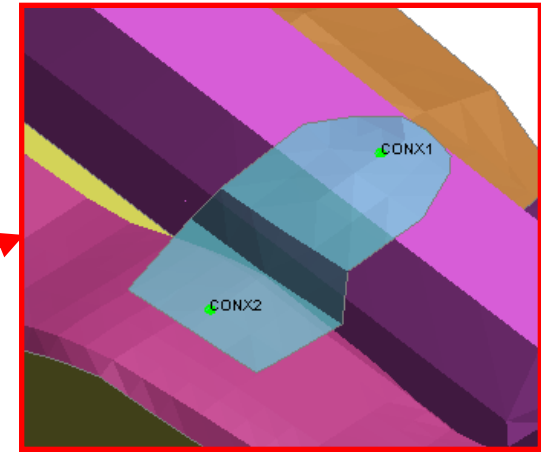
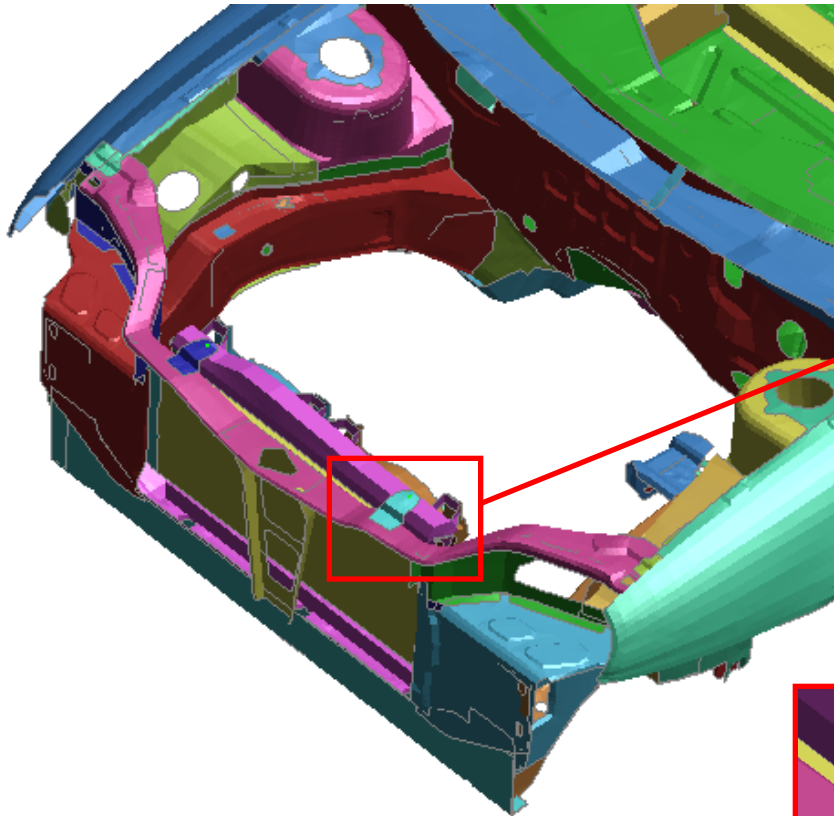


- Connection entities are written to the keyword file after \*END:

```
*CONNECTION_START_SPOTWELD
-291.77676 497.33395 346.71783      0      5.0      9998      2
*CONNECTION_LAYER_PART_ID
 10000066
*CONNECTION_LAYER_PART_ID
 10000051
*CONNECTION_ENTITIES
NODE      10277709  10277710  10277711  10277712  10277713
NODE      10277714  10277715  10277716
SOLID     10001723
*CONNECTION_END_SPOTWELD
```

- The associated FE entities are referenced, so that Primer knows which to delete if the connection is deleted or remade.
- If the model contains spotwelds but not connection entities (e.g. if the spotwelds were not made by Primer), these will be created automatically on entering the Connections menu.

- The disadvantage of having Connections entities is that confusion can arise if the connection entities become separated from their associated FE data, e.g. if split across INCLUDE files and only one of the files is read in.
- By default, Primer creates new connection data and the associated FE entities in the “Current Layer”.
- There are options in the Connections Table to manage the Include File location of connection data.

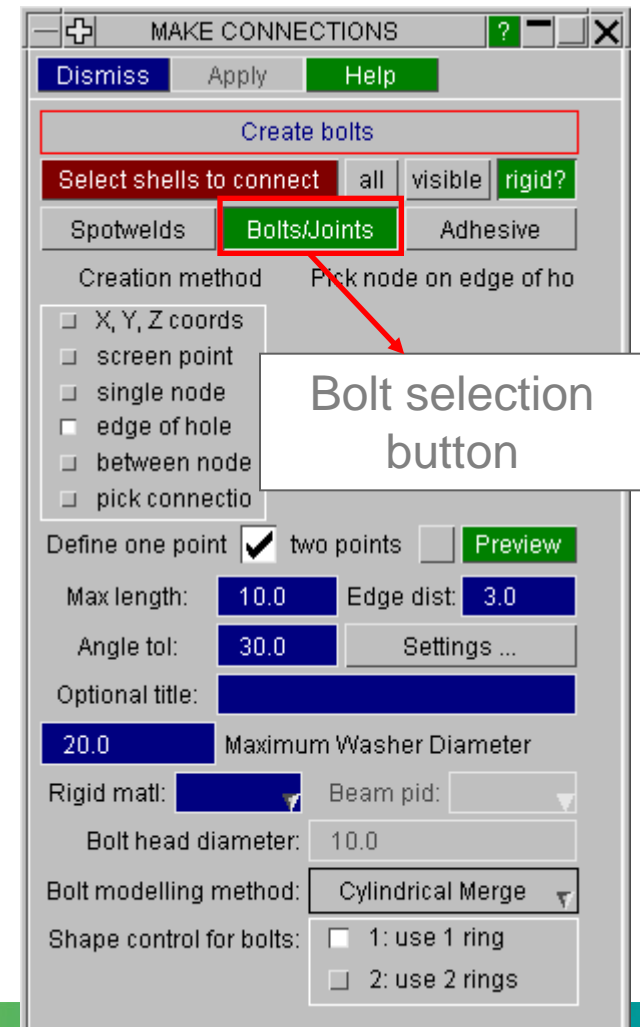
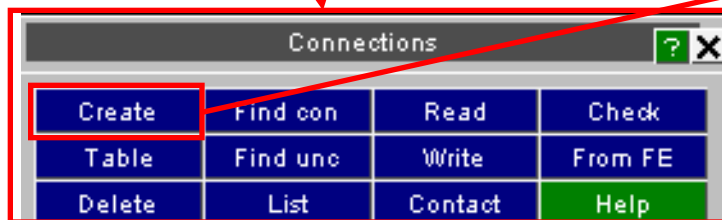


As well as spotwelds, Primer offers a “bolt” connection type.

Bolts can be “realized” as rigid patches or nodal rigid bodies

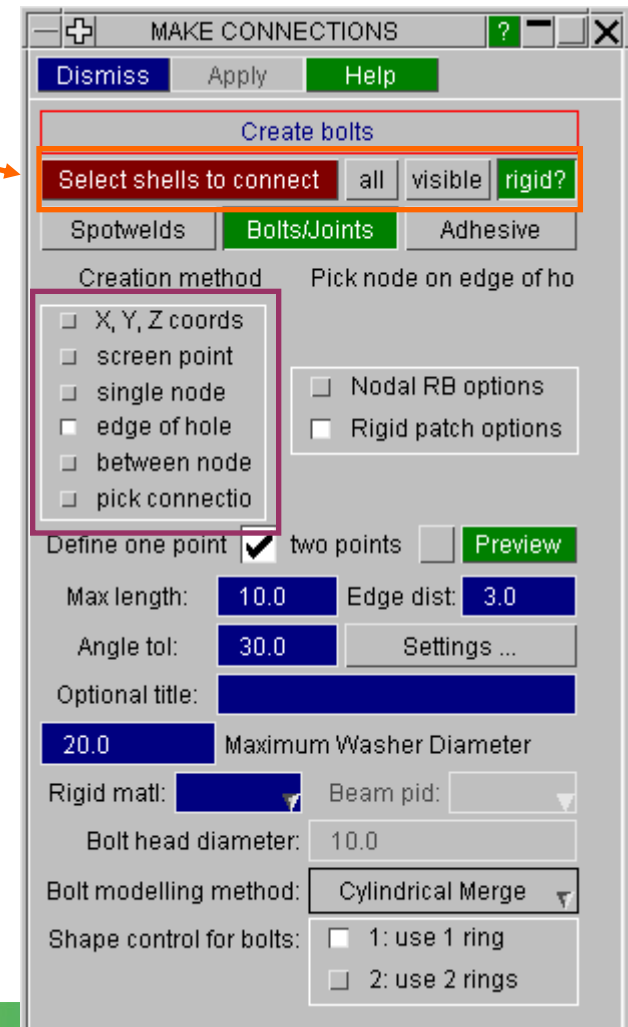
# Bolt connections

- Manual creation of bolts through Tools=>Connections=>Create
- This is very similar to creation of spotwelds



- Manual creation of bolts through Tools=>Connections=>Create:

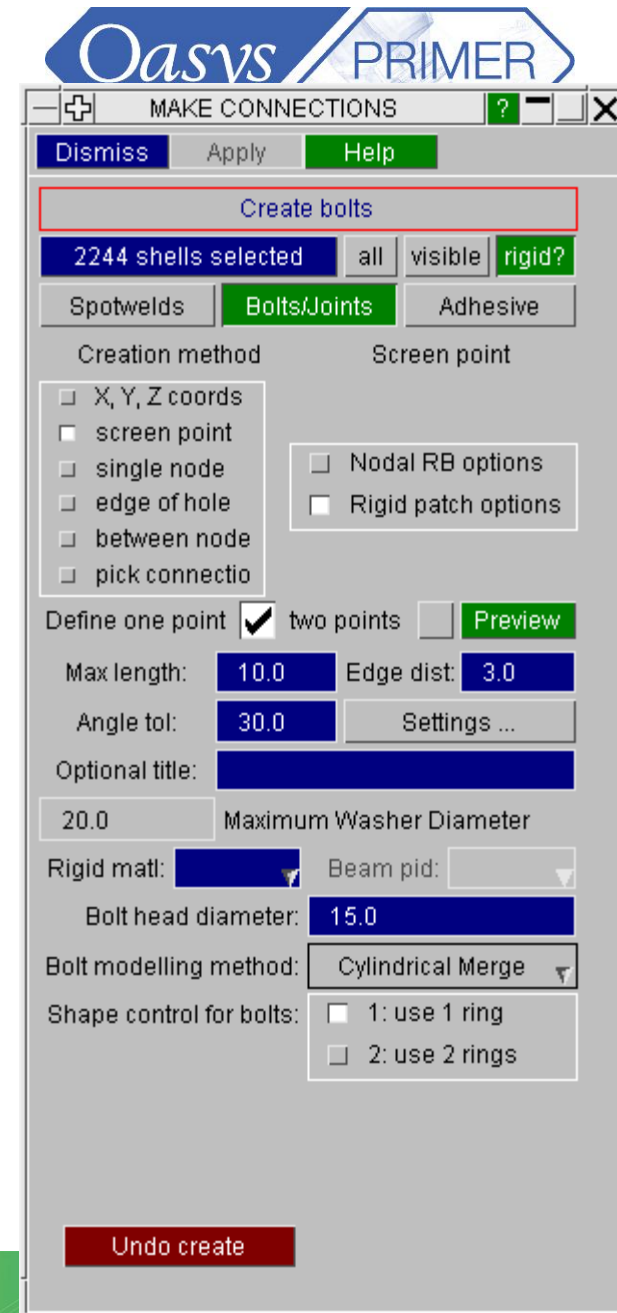
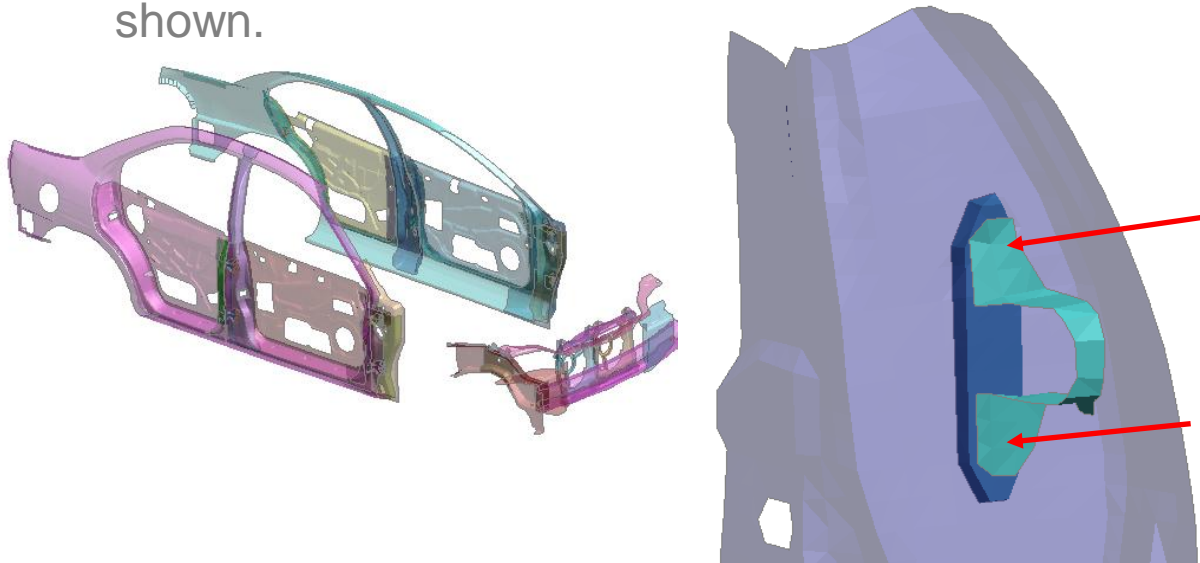
- Selection of shells/parts to connect.
- Bolt creation method:
  - X, Y, Z coords** – type in coordinate of bolt.
  - Screen point** – click on the screen to create bolt.
  - Single node** – pick an existing node as the position of the bolt.
  - Edge of hole** – pick a node at the edge of a hole and Primer will calculate the centre of the hole to use as the bolt position.
  - Between nodes** – pick two or more existing nodes, the bolt is created between them. Useful for creating bolts over holes.
  - Pick connection** – pick an existing Primer connection point.



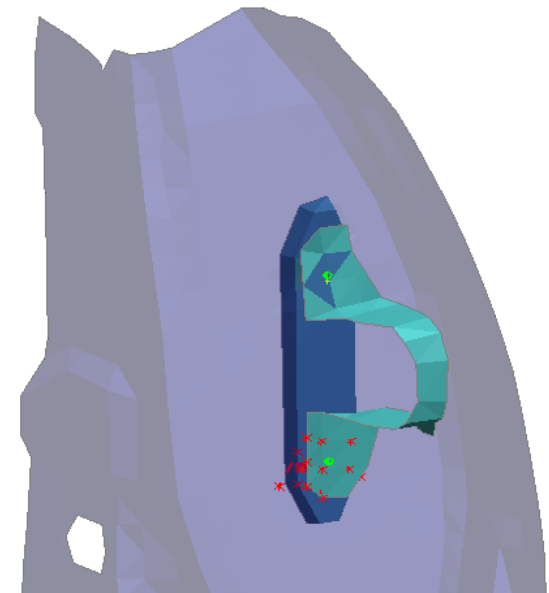
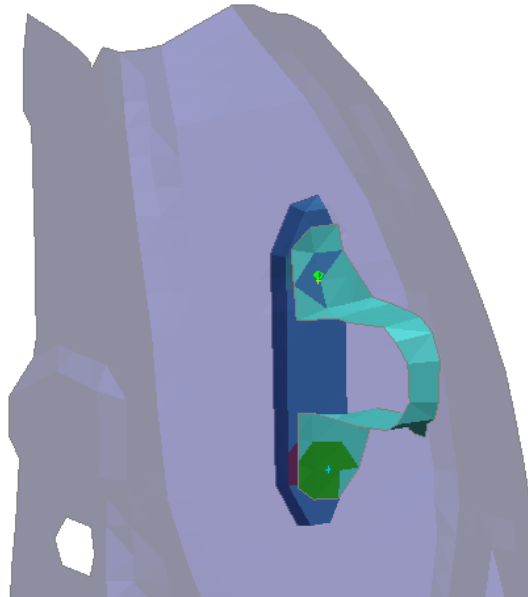
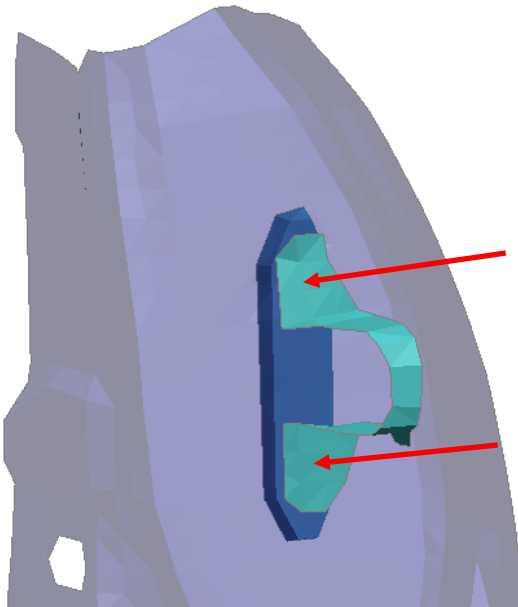
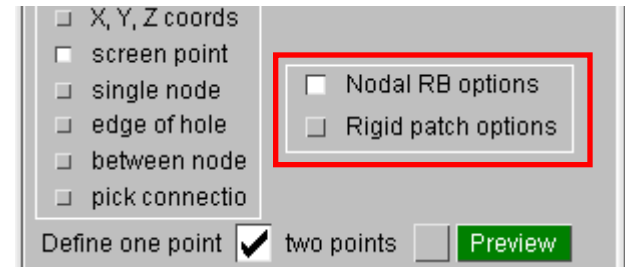


# Workshop – creating bolts

- Read in model demo\_bolts2.key.
- Blank all parts, unblank parts 260, 264, 276.
- Select the shell elements to connect (the unblanked parts – use “visible” button).
- Selection method “screen point”
- Set diameter to 15mm
- Create a “Cylindrical merge” bolt at the locations shown.

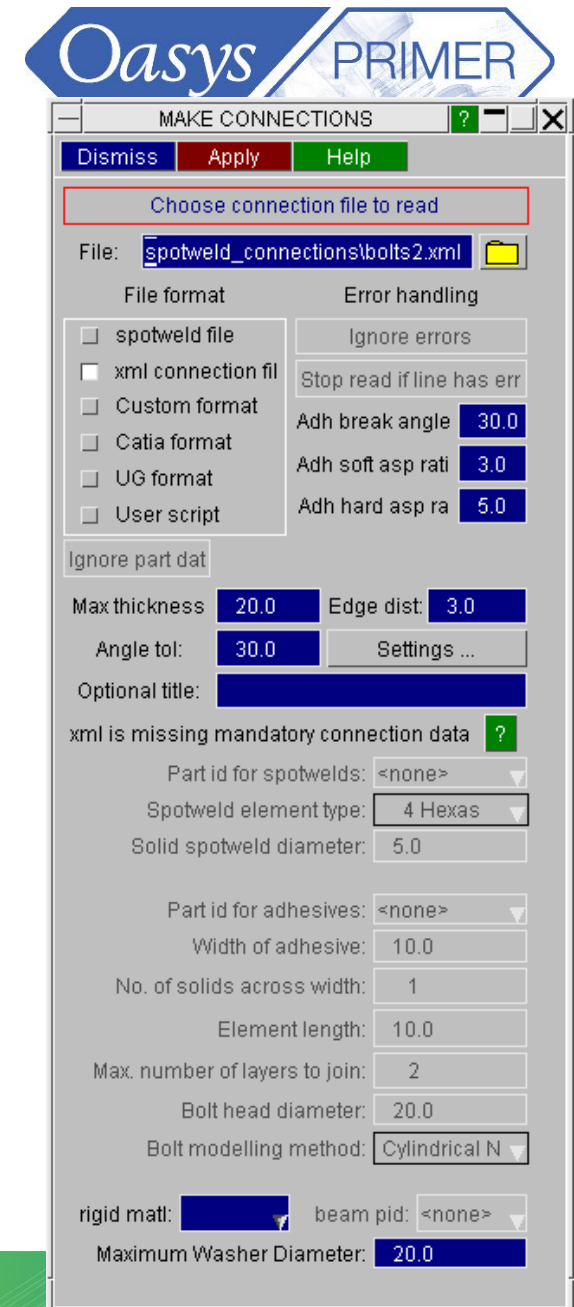
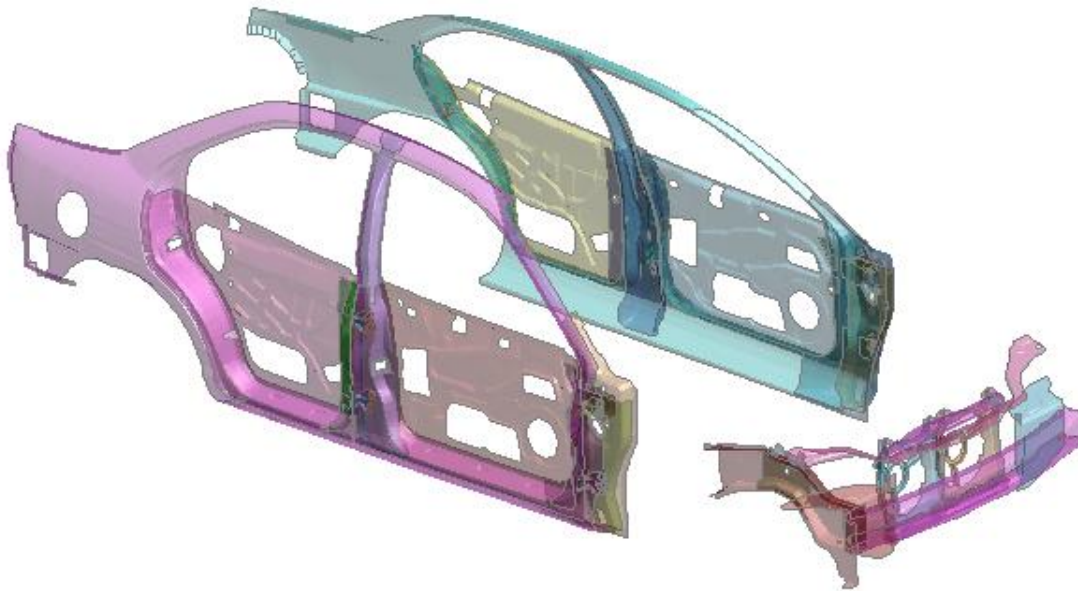


- Undo\_create (this removes the last one), change diameter to 20mm, and select the point again.
- Change bolt type to NRB (Nodal Rigid Body)
- Undo\_create, and select the point again.

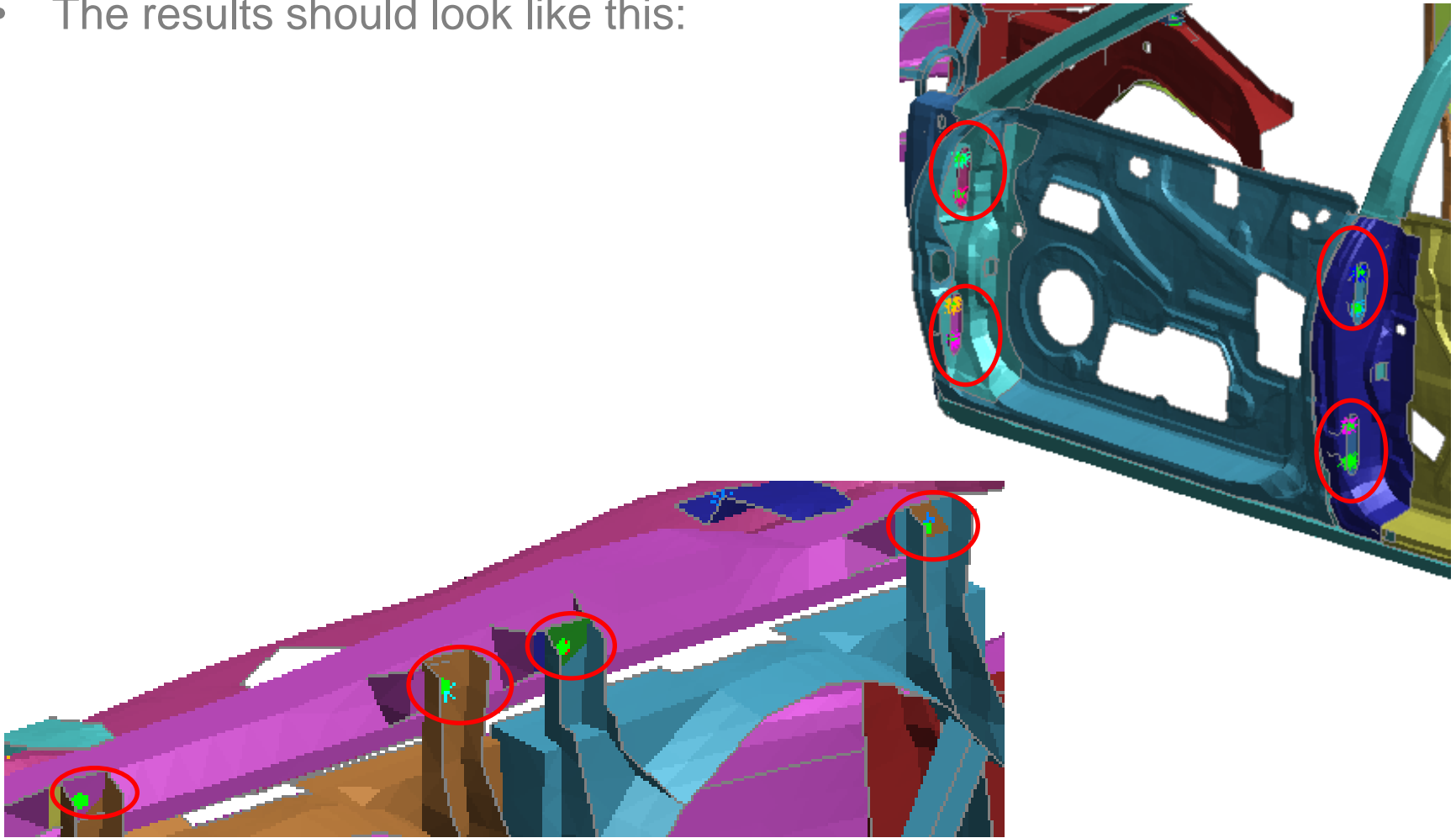


# Bolts from connection file

- Next we will try creating bolts from a connection file.
- Delete all the connections in the model.
- Read connections file bolts2.xml



- The results should look like this:



- The Connection Table can be used to modify bolts, in the same way as for spotwelds.
- You could even change a connection from a bolt to a spotweld or vice-versa.
- Start the connection table, asking for all connections in the model.

CONNECTION TABLE										
Dismiss		View...	Options...	Refresh	Action: update & remake		Show all		?	
Apply: Undo		All	Selected	Changed	Autoscale	Clear	Sel all	Select	Show sel	
ID	Type	Subtype	Part ID	Diameter	Layer 1	Layer 2	Layer 3	Status	Error	Details
1	RIGID	Cylindrical NR	<undefined>	20	P229	P233	P235	Invalid	BAD GEOM - ge	Centroid of she
2	RIGID	Cylindrical NR	<undefined>	20	P229	P233	P235	Invalid	BAD GEOM - ge	Centroid of she
3	RIGID	Cylindrical NR	<undefined>	20	P227	P231	P235	Invalid	BAD GEOM - ge	Centroid of she
4	RIGID	Cylindrical NR	<undefined>	20	P227	P231	P235	Realized		
5	RIGID	Cylindrical NR	<undefined>	20	P226	P230	P234	Realized		
6	RIGID	Cylindrical NR	<undefined>	20	P226	P230	P234	Realized		
7	RIGID	Cylindrical NR	<undefined>	20	P228	P232	P234	Realized		
8	RIGID	Cylindrical NR	<undefined>	20	P228	P232	P234	Invalid	BAD GEOM - ge	Centroid of she
9	RIGID	Cylindrical NR	<undefined>	20	P259	P263	P275	Invalid	BAD GEOM - ge	Centroid of she
10	RIGID	Cylindrical NR	<undefined>	20	P259	P263	P275	Realized		
11	RIGID	Cylindrical NR	<undefined>	20	P261	P265	P275	Realized		
12	RIGID	Cylindrical NR	<undefined>	20	P261	P265	P275	Invalid	BAD GEOM - ge	Centroid of she
13	RIGID	Cylindrical NR	<undefined>	20	P260	P264	P276	Realized		
14	RIGID	Cylindrical NR	<undefined>	20	P260	P264	P276	Invalid	BAD GEOM - ge	Centroid of she
15	RIGID	Cylindrical NR	<undefined>	20	P258	P262	P276	Invalid	BAD GEOM - ge	Centroid of she



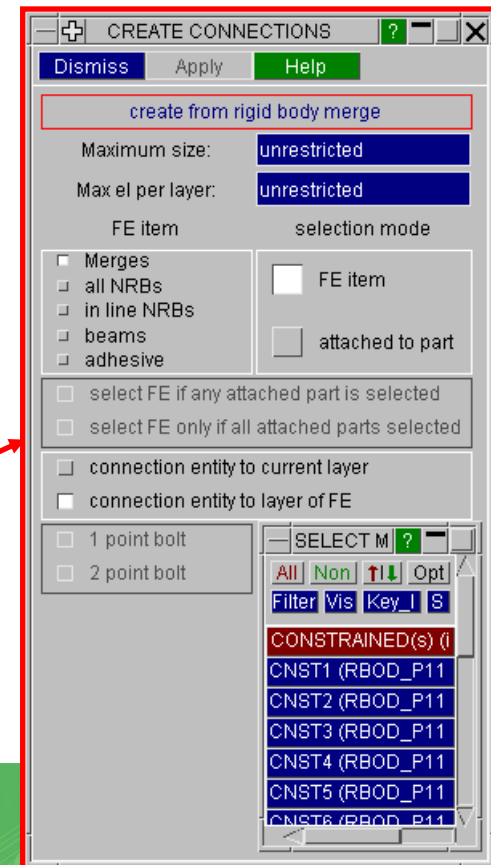
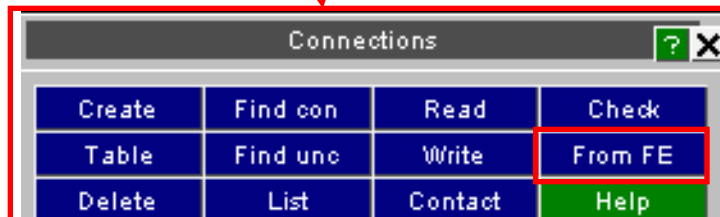
# Bolts – connection table

- Try changing the diameter of the first 15 nodal rigid bodies to 40mm; update & remake; Apply selected.

CONNECTION TABLE										
Dismiss View... Options... Refresh			Action: update & remake			Show all				
Apply: Undo All Selected Changed			Autoscale			Clear		Sel all Select		Show sel
ID	Type	Subtype	Part ID	Diameter	Layer 1	Layer 2	Layer 3	Status	Error	Details
1	RIGID	Cylindrical NR	<undefined>	20	P229	P233	P235	Invalid	BAD GEOM - ge	Centroid of she
2	RIGID	Cylindrical NR	<undefined>	20	P229	P233	P235	Invalid	BAD GEOM - ge	Centroid of she
3	RIGID	Cylindrical NR	<undefined>	20	P227	P231	P235	Invalid	BAD GEOM - ge	Centroid of she
4	RIGID	Cylindrical NR	<undefined>	20	P227	P231	P235	Realized		
5	RIGID	Cylindrical NR	<undefined>	20	P226	P230	P234	Realized		
6	RIGID	Cylindrical NR	<undefined>	20		P230	P234	Realized		
7	RIGID	Cylindrical NR	<undefined>	20		P232	P234	Realized		
8	RIGID	Cylindrical NR	<undefined>	20		P232	P234	Invalid	BAD GEOM - ge	Centroid of she
9	RIGID	Cylindrical NR	<undefined>	20		P263	P275	Invalid	BAD GEOM - ge	Centroid of she
10	RIGID	Cylindrical NR	<undefined>	20		P263	P275	Realized		
11	RIGID	Cylindrical NR	<undefined>	20		P265	P275	Realized		
12	RIGID	Cylindrical NR	<undefined>	20		P265	P275	Invalid	BAD GEOM - ge	Centroid of she
13	RIGID	Cylindrical NR	<undefined>	20		P264	P276	Realized		
14	RIGID	Cylindrical NR	<undefined>	20	P260	P264	P276	Invalid	BAD GEOM - ge	Centroid of she
15	RIGID	Cylindrical NR	<undefined>	20	P258	P262	P276	Invalid	BAD GEOM - ge	Centroid of she

# Bolts – creating connection data

- If the model already contains bolts modelled by NRB or merged rigid patches, but does not contain connection entities, you will not be able to remake the connections, write them to file, apply in another model, etc.
- Using the “From FE” feature, Primer can find bolts in the model by matching rigid body merges or nodal rigid bodies against the user-supplied size and part list.



- Automatic creation of connection points from FE data (note as well as rigid constraints beams and adhesive solids and be converted here as well):
  - Various options are available when creating connection points from FE data:

The screenshot shows the 'CREATE CONNECTIONS' dialog box with the following options and callouts:

- Maximum size:** unrestricted (Callout: The maximum size of the constraint selected can be set here)
- Max el per layer:** unrestricted
- FE item selection mode:**
  - ☒ Merges
  - ☒ all NRBs
  - ☒ in line NRBs
  - ☒ beams
  - ☒ adhesive
  - ☐ FE item (Callout: For "Selection mode", if "FE item" is chosen a list of all the rigid constraints of the selected type (NRB or merge) appears at the bottom. You select the constraint(s) you wish to convert to a connection definition here)
  - ☐ attached to part
- ☐ select FE if any attached part is selected
- ☐ select FE only if all attached parts selected
- ☐ connection entity to current layer
- ☐ connection entity to layer of FE
- ☐ 1 point bolt
- ☐ 2 point bolt

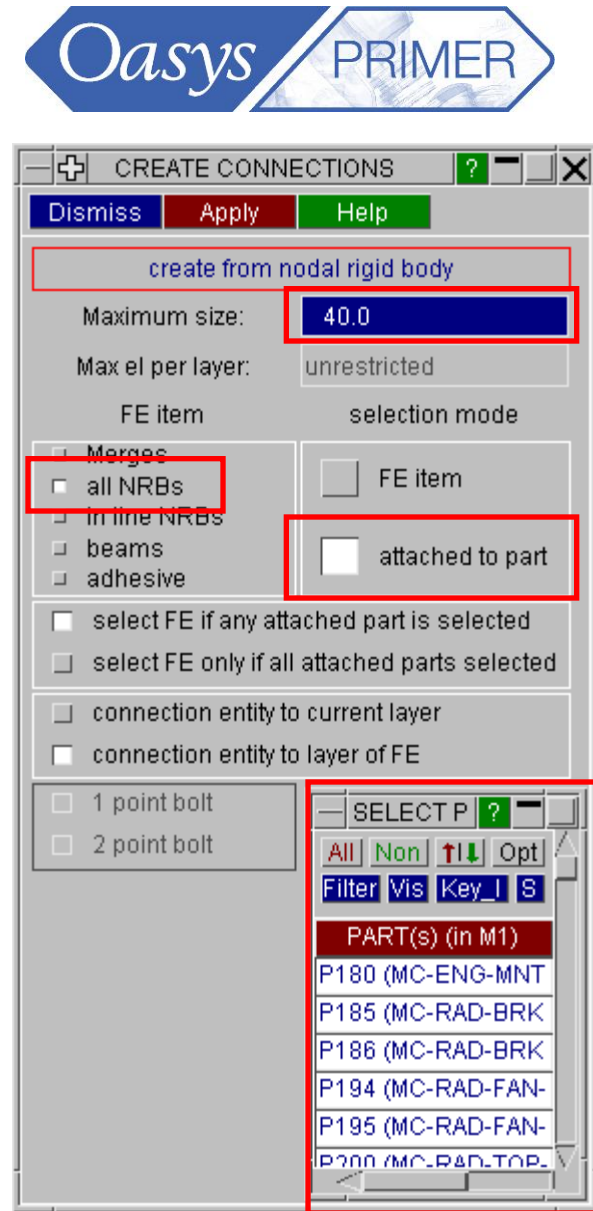
The 'SELECT M' list at the bottom shows the following constraints:

CONSTRNED(s) (i)
CNST1 (RBOD_P11)
CNST2 (RBOD_P11)
CNST3 (RBOD_P11)
CNST4 (RBOD_P11)
CNST5 (RBOD_P11)
CNST6 (RBOD_P11)

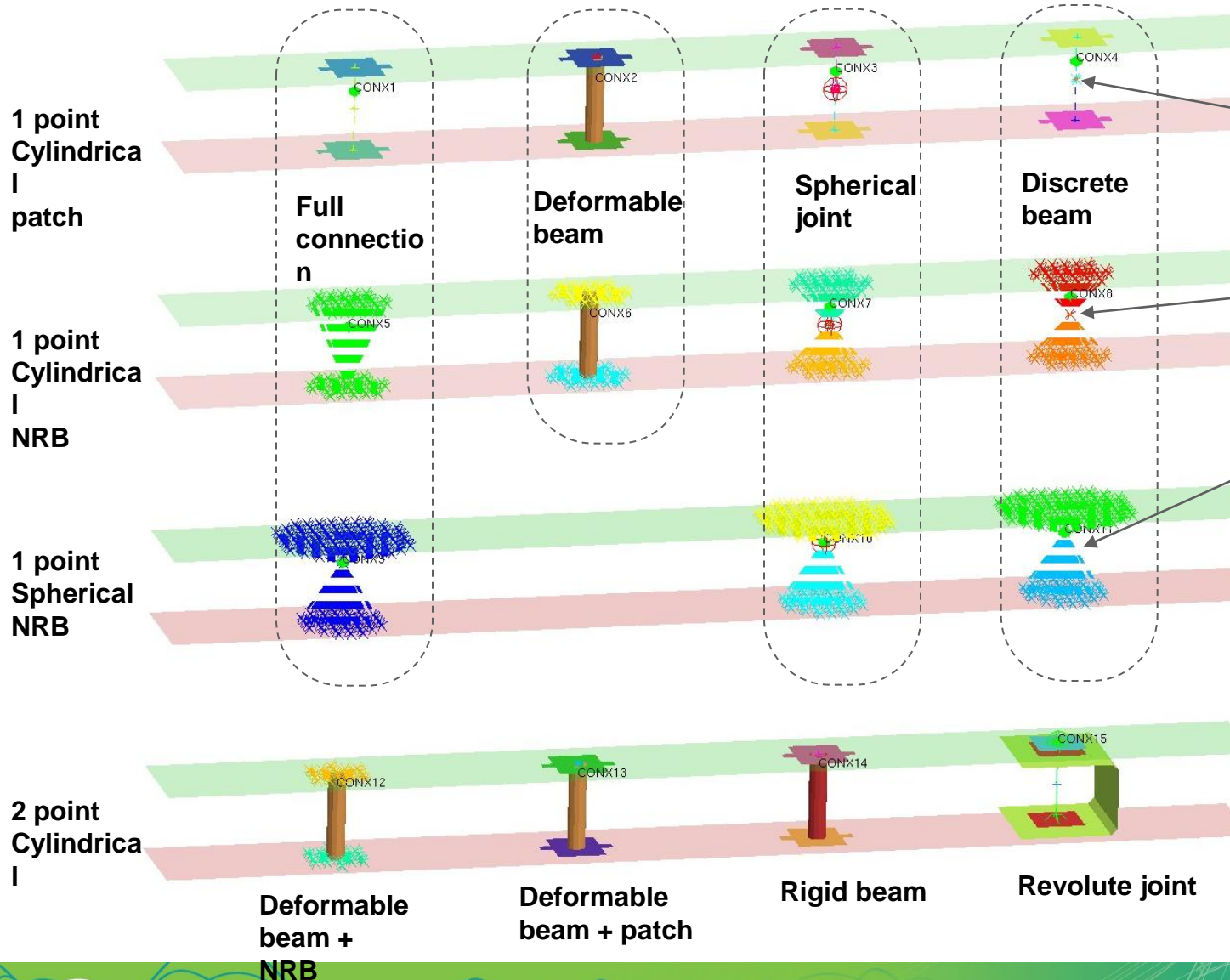
(Callout: The type of FE selected can be chosen here points to the 'FE item' selection mode)

# Bolts – creating connection data

- Delete all models from Primer.
- Read model bolts\_without\_connx2.key
- In the entities panel (shortcut key 'e'), switch on Constrained.
- View the model – the bolts are present.
- Go to the Connection menu. Most of the buttons are greyed out, because no connection data is present.
- Press From FE
- Set the FE item to “all nrbs”, switch selection mode to “attached to part”. Select ALL parts (in this case Primer will look for NRBs attached to all parts in the model)
- Enter 40 as the maximum size (NRBs larger than this will be assumed not to be bolts); Press Apply
- Check in the Connection Table that connections have been generated.
- A connections file could now be written, allowing the same bolts to be re-created in another model.



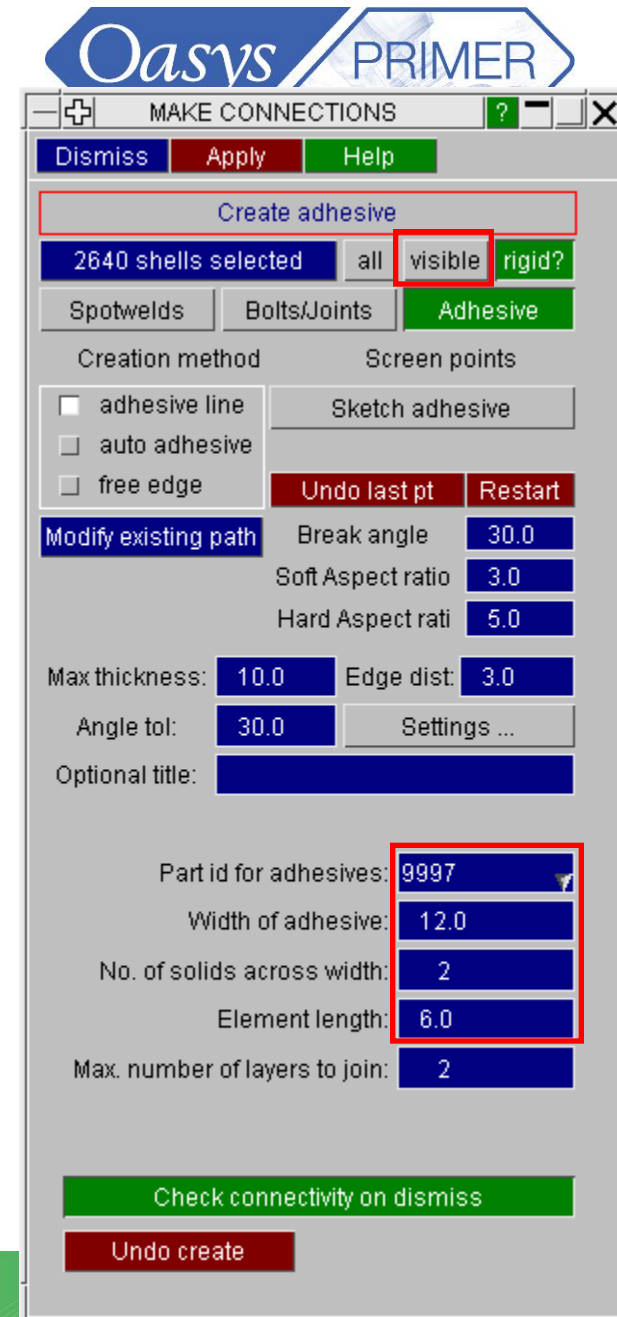
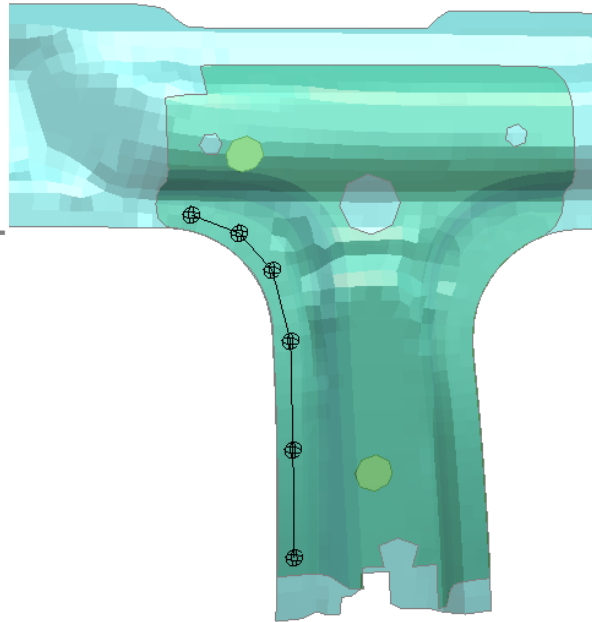
# Bolt Connections Summary





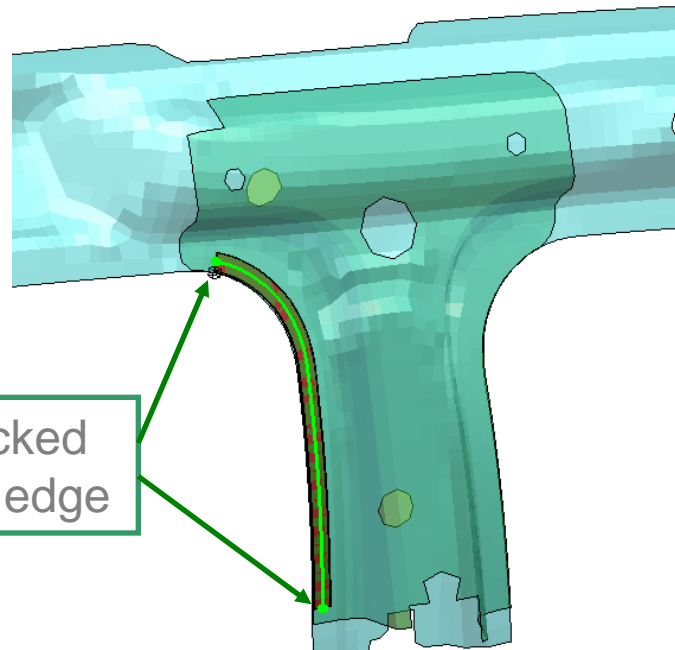
# Adhesive – create manually

- Delete model from Primer. Read joint\_bpost.key.
- Blank all parts except 8712, 82151.
- Connection=>Create=>Adhesive.
- Select the visible parts (“visible”)
- Select part 9997.
- Width = 12mm
- No of solids across = 2
- Element length = 6mm
- Create a line on the left-hand flange, Apply.
- **Don't close the window**
- Use a Line plot to view the result (shortcut “L”).



# Adhesive – create manually

- Click “Undo create” to delete the adhesive just created.
- Switch the creation method to “free edge”.
- This allows you to create a run of adhesive from one free edge. Select 2 nodes along one free edge to create the adhesive.



Two nodes picked  
along part free edge

**Oasys PRIMER**

MAKE CONNECTIONS

Dismiss Apply Help

Create adhesive - Select free edge start node

2640 shells selected all visible rigid?

Spotwelds Bolts/Joints Adhesive

Creation method Free edge nodes

☐ adhesive line

☐ auto adhesive

☒ free edge

Sketch adhesive

Min run length 30.0

Glue edge dist 1.0

Break angle 30.0

Soft Aspect ratio 3.0

Hard Aspect ratio 5.0

Modify existing path

Max thickness: 10.0 Edge dist: 3.0

Angle tol: 30.0 Settings ...

Optional title:

Part id for adhesives: 9997

Width of adhesive: 12.0

No. of solids across width: 2

Element length: 6.0

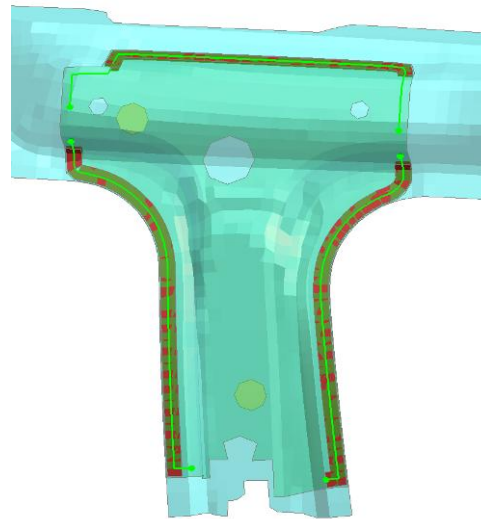
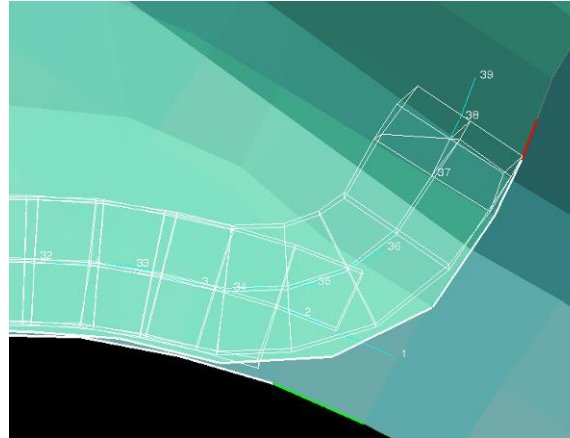
Max. number of layers to join: 2

Check connectivity on dismiss

Undo create

# Adhesive – automatic creation

- Click “Undo create” to delete the adhesive just created.
- Change to auto-adhesive method. This method uses the panel free edges to decide where to create the adhesive.
- Sketch adhesive, check the result. At the corners, some elements have overlapped.
- For “master part”, select the green part. Sketch again. Now, only the green part’s free edge is used to decide where to create the adhesive.
- Apply.



**Oasys PRIMER**

MAKE CONNECTIONS

Dismiss Apply Help

Create adhesive

2640 shells selected all visible rigid?

Spotwelds Bolts/Joints Adhesive

Creation method Adhe. parameters

☐ adhesive line

☒ auto adhesive

☐ free edge

Sketch adhesive

Min run length 30.0

Glue edge dist 1.0

Break angle 30.0

Soft Aspect ratio 3.0

Hard Aspect ratio 5.0

Max thickness: 10.0 Edge dist: 3.0

Angle tol: 30.0 Settings ...

Optional title:

Part id for adhesives: 9997

Width of adhesive: 12.0

No. of solids across width: 2

Element length: 6.0

Max. number of layers to join: 2

☐ Master Part

☐ Master Part Set 8712

Check connectivity on dismiss

Undo create

# Adhesive – modifying the path

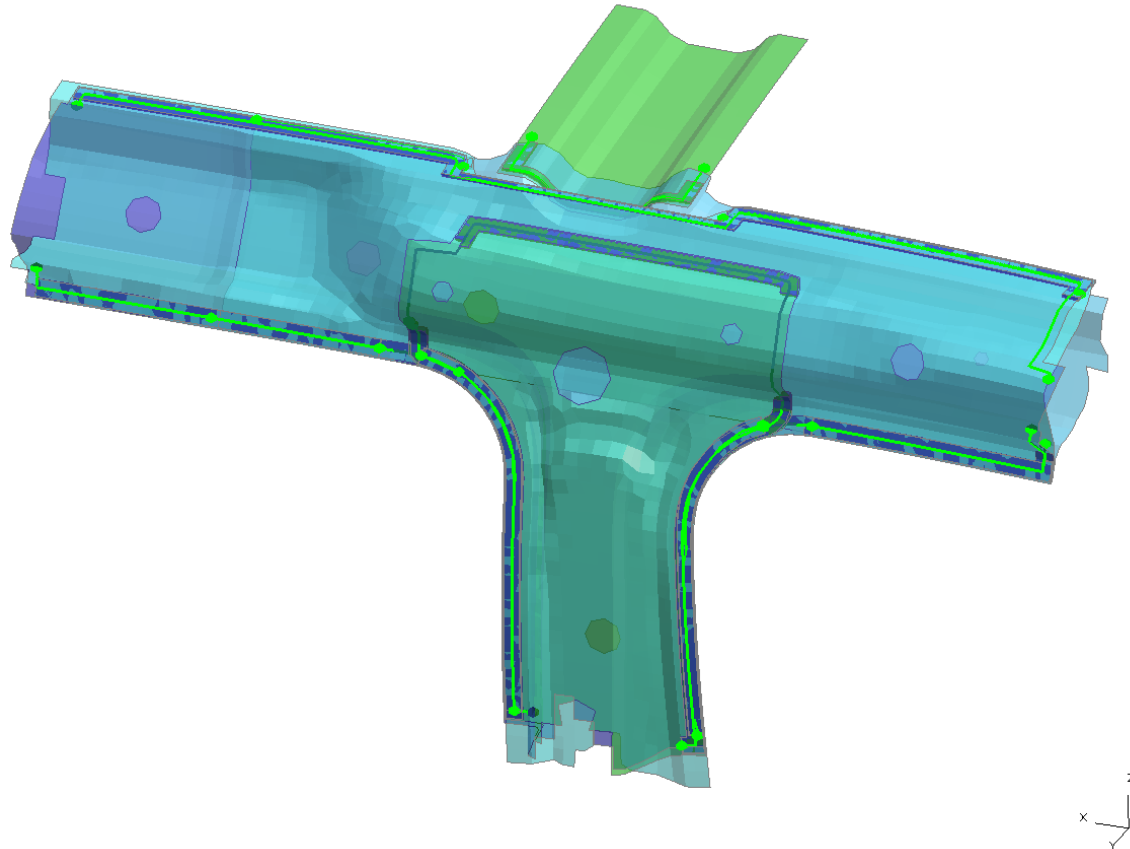
- Dismiss the adhesive creation menu.
- Create a tied contact (connection=>contact).
- Go to the connection table.
- Using the View button, add “adhe path” column.
- Right-click on the path ID in the table, Edit.
- Press “sketch”. This menu allows points on the path to be deleted, moved, etc.

The screenshot displays the 'SECTION TABLE' window with a table containing columns for Error, Details, X, Diameter, Subtype, and Adhe. path. The 'Adhe. path' column is highlighted. Below the table, the 'Edit Adhe. path contents' dialog box is open, showing a 'Split' button and a 'Split gap' of 10.0. The dialog also contains a table with columns for X, Y, and Z coordinates, and a 'Pick' button. To the right of the dialog, a context menu is visible with options: 'Change Adhe. path', 'Sketch conx', 'Show conx & panels', 'Update & remake', 'Upd & remake at av'ge', and 'Edit...'. At the bottom right, a 3D model of a structure is shown with a path highlighted in red and green.

Error	Details	X	Diameter	Subtype	Adhe. path
d		3370.93	n/a	Solid	82
d		3582.45	n/a	Solid	85

	X	Y	Z	Pick
Start	3582.445	673.3091	2367.295	Pick
1	3582.442	667.2346	2362.075	Pick
2	3582.45	662.6647	2355.69	Pick
3	3582.464	662.8331	2349.696	Pick
4	3581.698	665.0792	2343.868	Pick
5	3578.758	666.0301	2341.363	Pick
6	3571.994	666.4207	2340.324	Pick
7	3563.136	667.1619	2338.343	Pick
8	3553.961	668.1614	2335.676	Pick
9	3544.524	669.7258	2331.477	Pick
End	3480.24	723.5145	2113.939	Pick

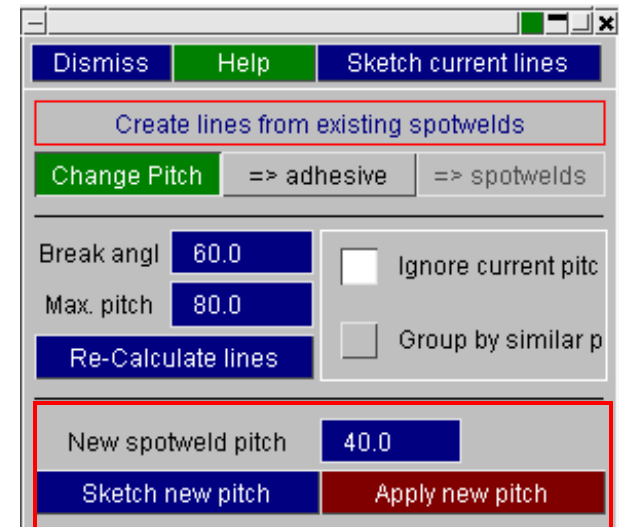
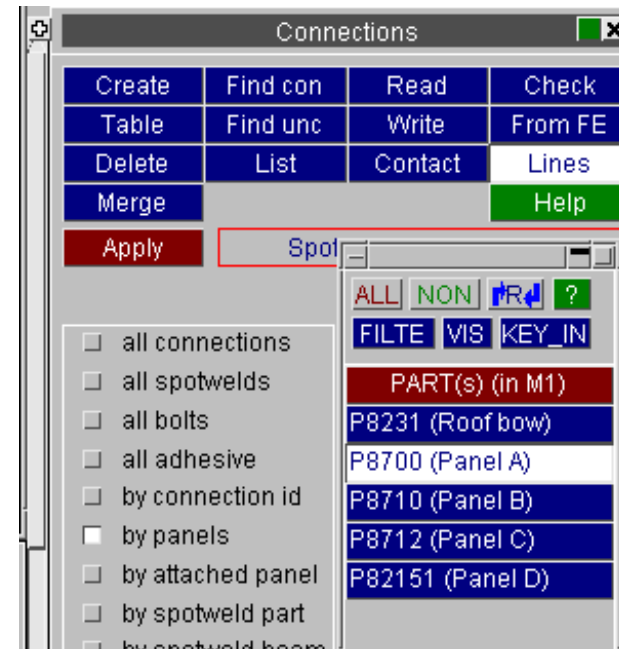
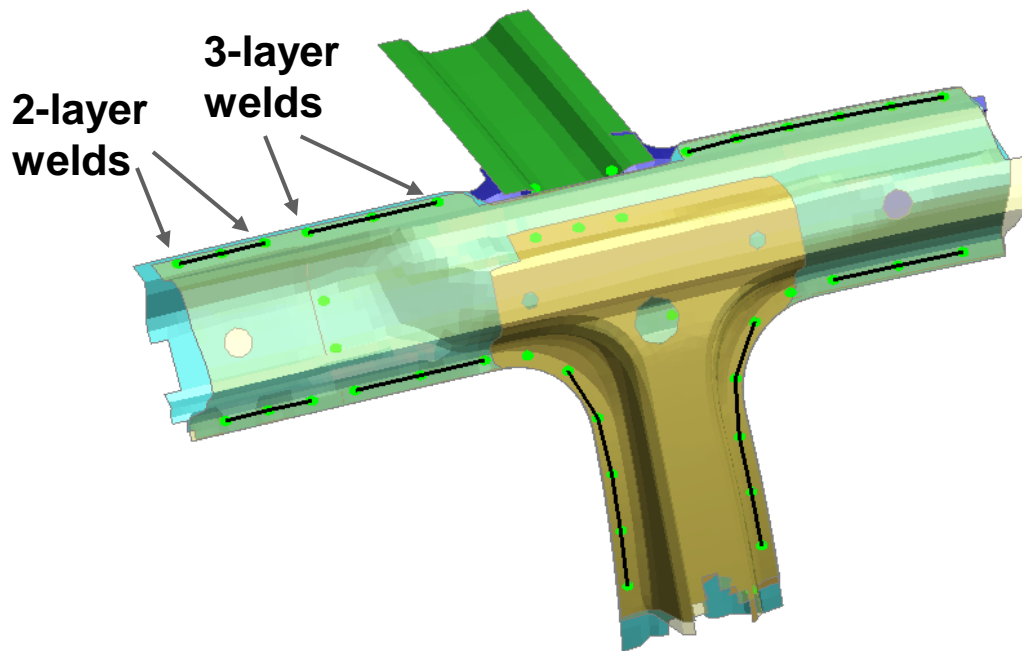
- Adhesive connections may be written to and read from a connection file.
- Delete all connections.
- Read the connection file adhesive.xml.





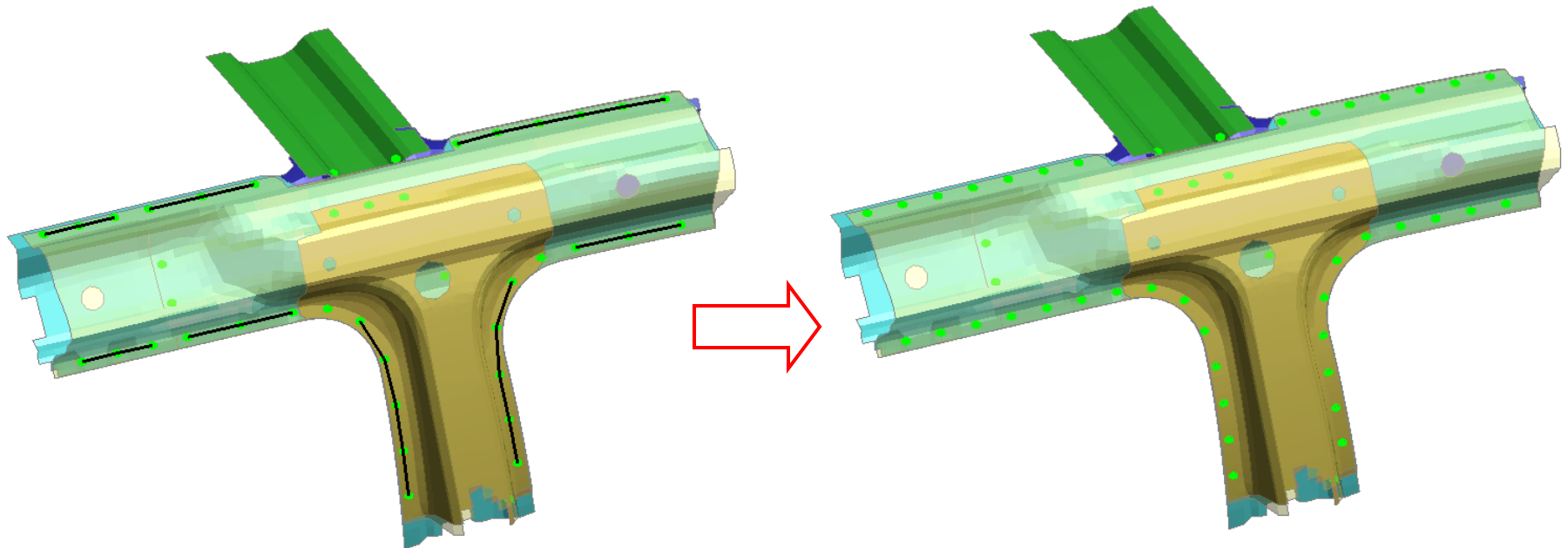
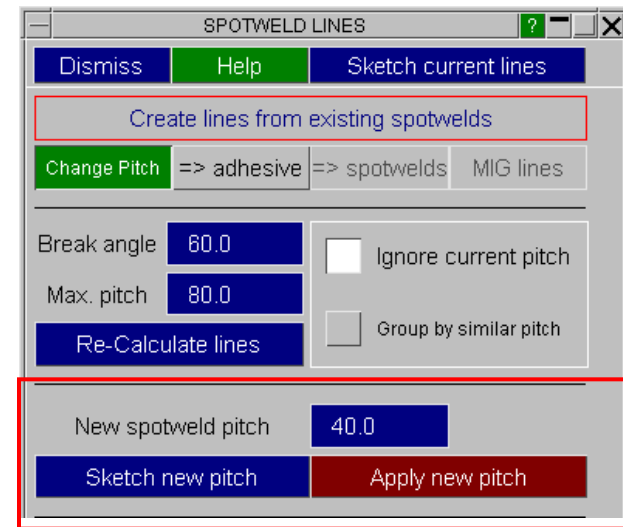
# Spotwelds - lines

- Tools=>Connections=>Lines
- Select Spotwelds
- Primer automatically finds lines of spotwelds that connect the same panels



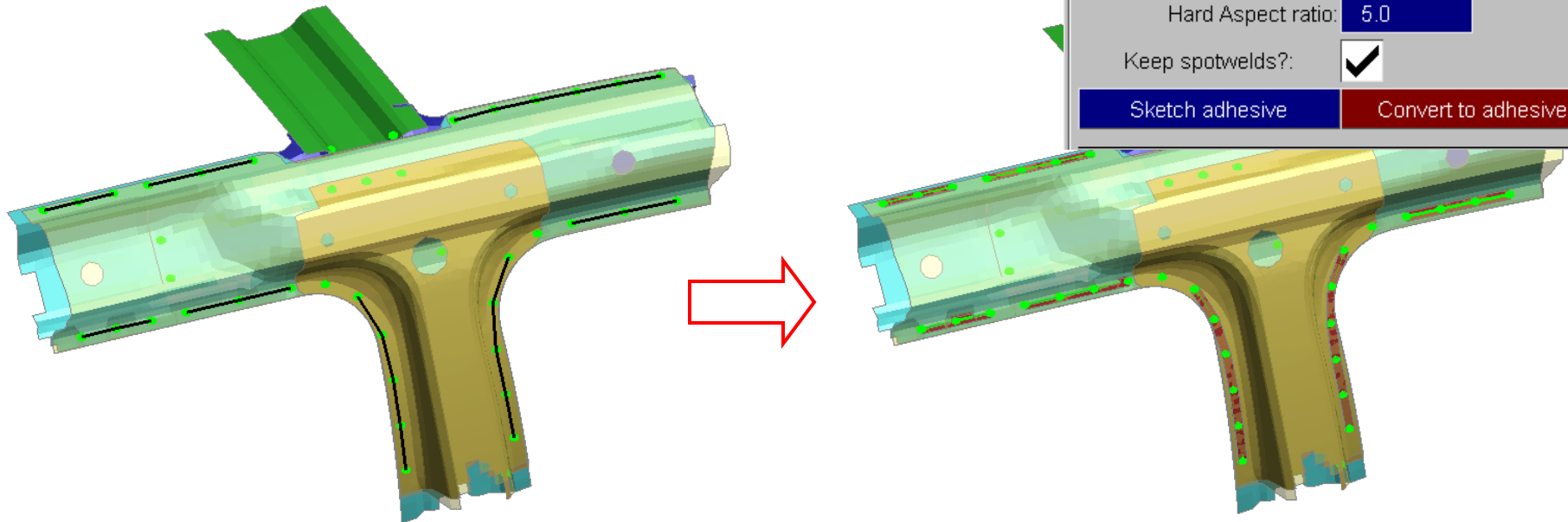
# Spotwelds - lines

- Change pitch of welds
- This can also be done using batch commands for incorporation in automatic processes



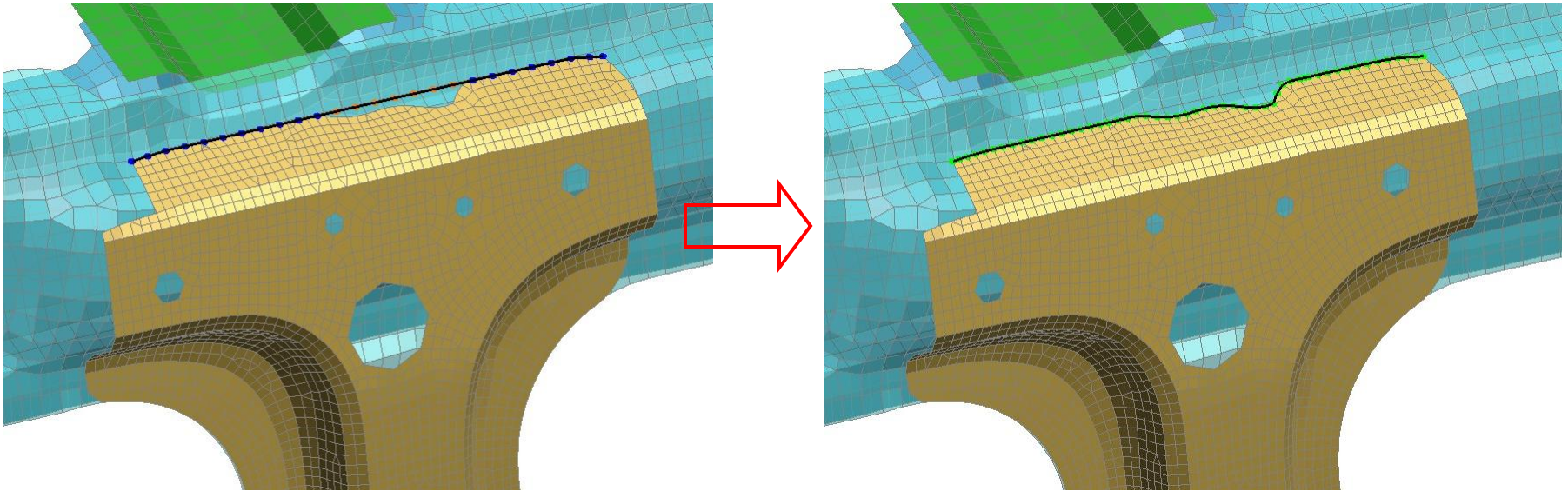
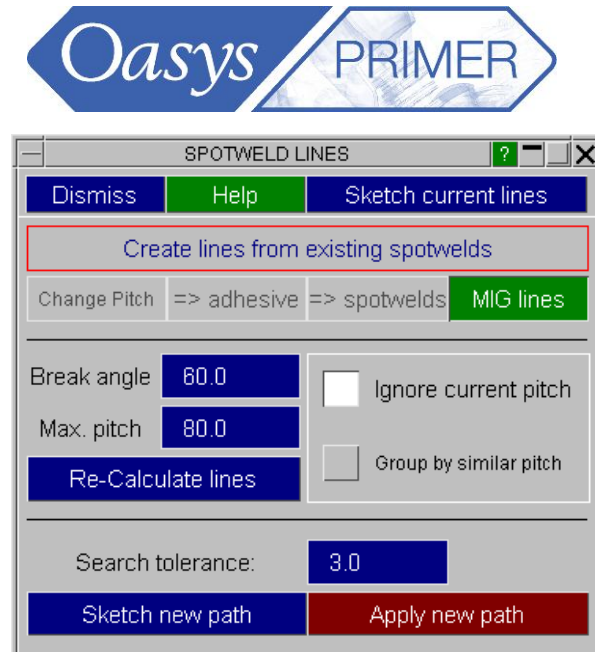
# Spotwelds - lines

- Add adhesive or change spotwelds into adhesive or vice-versa.



# Spotwelds - lines

- Re-project lines of MIG welds to follow new mesh/free-edge.





# Oasys PRIMER: Spotwelding and Connections

Training course