

ESATAN-TMS

# Release Notes



# Table of Contents

<b>1</b>	<b>Introduction.....</b>	<b>3</b>
<b>2</b>	<b>Developments .....</b>	<b>4</b>
	Modelling insulation.....	4
	Extended support for orbital modelling on moons.....	5
	Additional input data validation within Workbench.....	6
	Extended support for description fields .....	6
	Visualise point labels on geometry.....	7
	Improved picking and information table.....	7
	Radiative – New execution dialog .....	8
	Radiative – Improved assembly pointing during eclipse .....	8
	Radiative - Running multiple radiative cases.....	9
	Radiative – Improved solution from analysis case.....	9
	Post Processing – Display connected nodes.....	9
	Post Processing – Chart label column.....	10
	Post Processing – New sink temperature attribute.....	10
	Post Processing – New delta chart attribute.....	10
<b>3</b>	<b>Problems fixed.....</b>	<b>11</b>
	Workbench.....	11
	Thermal .....	16
<b>4</b>	<b>Points to note .....</b>	<b>17</b>
<b>5</b>	<b>Migrate from previous version.....</b>	<b>18</b>
<b>6</b>	<b>Contact information .....</b>	<b>19</b>

# 1 Introduction

ESATAN-TMS 2024 is another significant evolution of the product, providing new functionality that significantly enhances the thermal modelling capability of Workbench. The major new features are the ability to model insulation applied to geometry and extensions to the radiative case modelling to support orbital modelling on moons.

ESATAN-TMS 2024 development also delivers a number of feature enhancements that result from discussions with and requests from users.

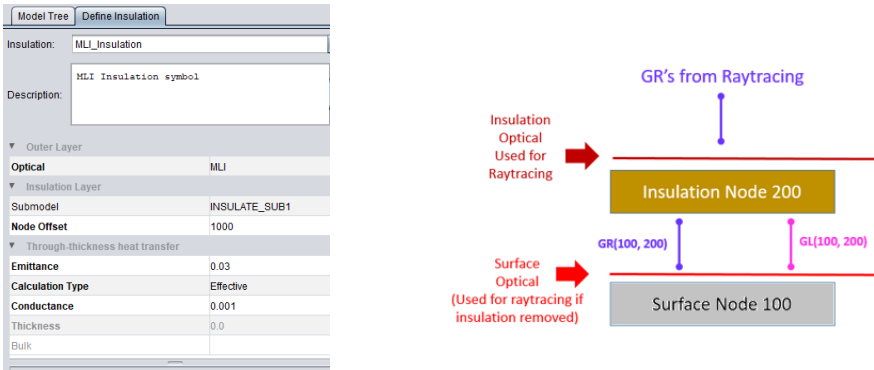
The following sections describe the main changes introduced within the ESATAN-TMS 2024 release.

- **Modelling insulation** [<more detail>](#)
- **Extended support for orbital modelling on moons** [<more detail>](#)
- **Additional input data validation within Workbench** [<more detail>](#)
- **Extended support for description fields** [<more detail>](#)
- **Visualise point labels on geometry** [<more detail>](#)
- **Improved picking and information table** [<more detail>](#)
- **Radiative – New execution dialog** [<more detail>](#)
- **Radiative – Improved assembly pointing during eclipse** [<more detail>](#)
- **Radiative - Running multiple radiative cases simultaneously** [<more detail>](#)
- **Radiative – Improved solution from analysis case** [<more detail>](#)
- **Post Processing – Display of connected nodes** [<more detail>](#)
- **Post Processing – Attribute chart label column** [<more detail>](#)
- **Post Processing – New sink temperature attribute** [<more detail>](#)
- **Post Processing – New delta chart attribute** [<more detail>](#)

# 2 Developments

## Modelling insulation

Insulation can now be modelled in ESATAN-TMS by defining an insulation material symbol and applying it to the surfaces of the geometry. This creates an additional layer of nodes on the geometry that represent the insulation layer. Conductive and radiative conductors are automatically created between the underlying geometry surface nodes and those of the insulation layer.



For surfaces covered with insulation, the radiative calculation will be performed from the outermost layer of the geometry using the optical properties of the insulation symbol instead of those of the underlying surface.

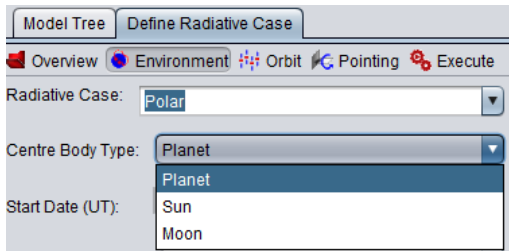
Surface 1	
Label	PX_Panel
Activity	Active
Radiative Criticality	Normal
Submodel Name	
Base Node Number	3100
Node Increment in Direction 1	1
Node Increment in Direction 2	
Optical Coating	MLI
Insulation	Insulation
Colour	PALE_BLUE

The ability to remove insulation from individual faces has been added allowing for modelling radiators and holes in the insulating layer. Alongside this, a new insulation material overlay as well as a new picking mode named covering have been added allowing the display temperature or heat fluxes on the geometry, the insulation or the outermost layer.



# Extended support for orbital modelling on moons

ESATAN-TMS is being updated as part of this release to support orbital modelling around moons. This will allow thermal analysis for spacecraft undertaking missions to natural satellites in the Solar System. In the first instance this is Earth’s own Moon, but moons of other planets, in particular those of Jupiter, are also to be included in this development.



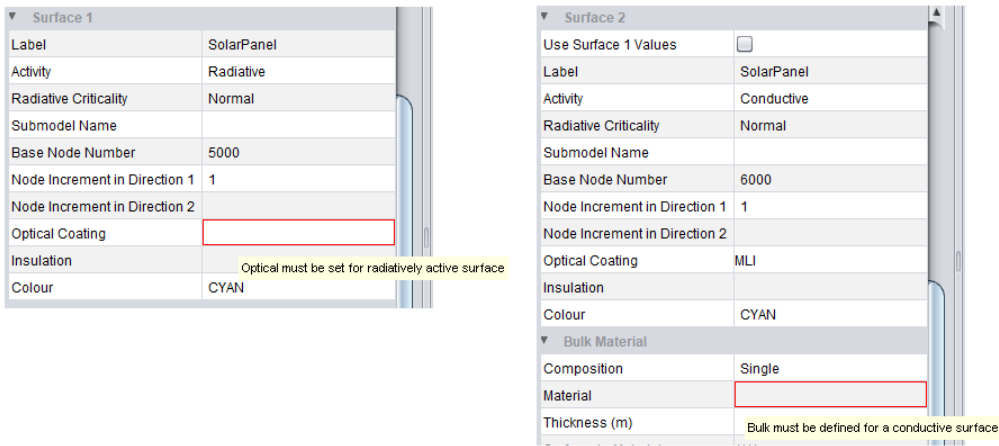
For missions around a moon, ESATAN-TMS provides additional functionality such as radiative case option for celestial body orbits to be determined implicitly from given date/time, i.e. not by direct input of orbital parameters as well as a preset list of all the moons available based on the selected planet. The following moons are now supported in ESATAN-TMS: Luna, Phobos, Europa, Io, Ganymede, Calisto, Titan and Enceladus

ESATAN-TMS radiative case dialog has been simplified with dedicated sections for planet / sun alongside a new orbit definition method called intrinsic. This new method will reduced the number of input data required to be entered, taken them from ephemeris files provided with the installation. The existing method, now called user-defined is still available in the tool.

Position Calculation:	Intrinsic
ICS inertial wrt:	<input type="radio"/> Sun <input checked="" type="radio"/> Vernal point
Planet Data	
Name	Earth
Radius (m)	6371000.0
Gravitational Acceleration (m/s2)	9.798
Albedo	0.306
Temperature (K)	254.3
Infra-Red Emissivity	1.0
Sun Data	
Radius (m)	6.958e+08
Temperature (K)	5778.0
Solar Constant Override (W/m2)	0.0
Sun Rays	Parallel Rays
Sun Distance Override (m)	0.0

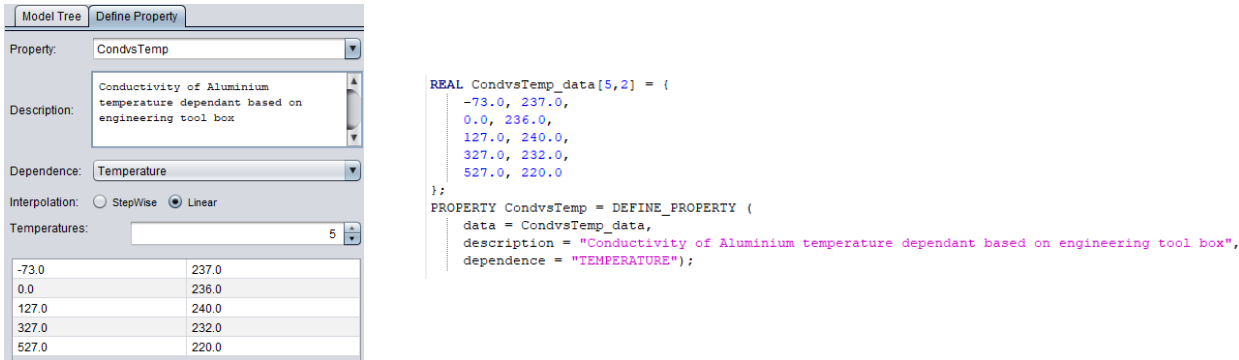
# Additional input data validation within Workbench

The properties panel of the geometry definition dialog has new validation checks for the bulk, thickness and optical fields. These validation checks apply when using the activity types Conductive and Radiative. Validation errors indicate when a Conductive surface does not have a value for its bulk or thickness fields. For Radiative surfaces optical fields are checked.



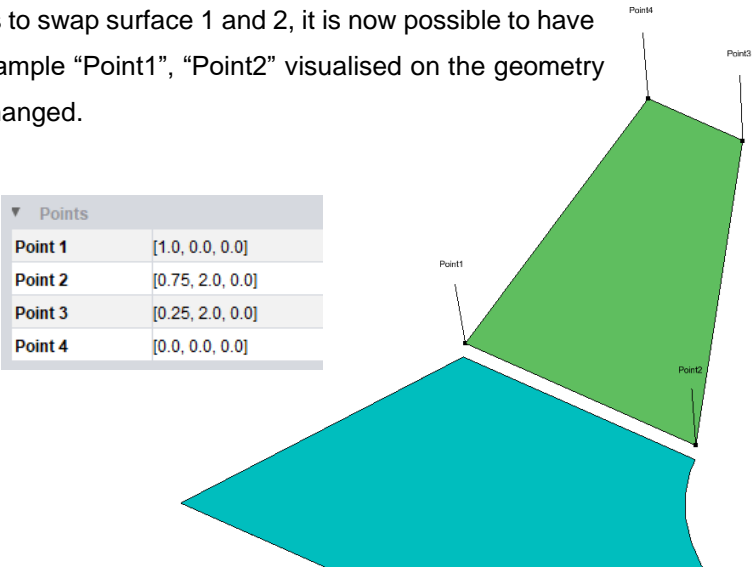
# Extended support for description fields

A wider range of symbol now include a description field. These fields are useful for storing additional information for example to describe the source of data held in the symbols. Properties, user-defined conductors, boundary conditions, conductive interface and contact zone now support this new field. Both the Workbench and the language have been updated to support this additional field.



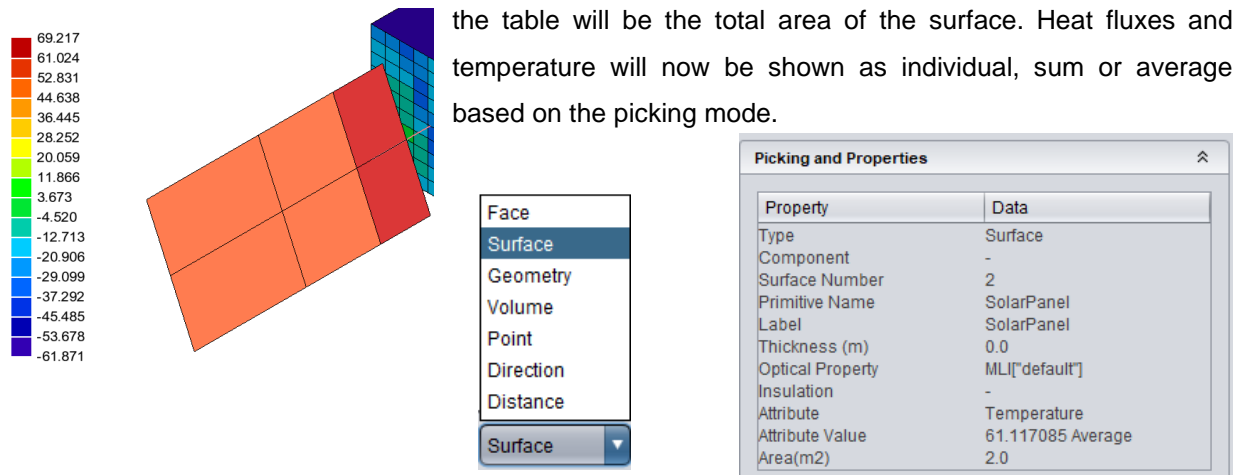
## Visualise point labels on geometry

When re-defining a geometry, such as to swap surface 1 and 2, it is now possible to have the labels of point parameters, for example “Point1”, “Point2” visualised on the geometry to help identify which point is being changed.



## Improved picking and information table

The attribute value based on the picking mode has been improved. Values such as area, heat fluxes or temperature will now be based on the picking mode. If surface is selected, the attribute value returned in the table will be the total area of the surface. Heat fluxes and temperature will now be shown as individual, sum or average based on the picking mode.

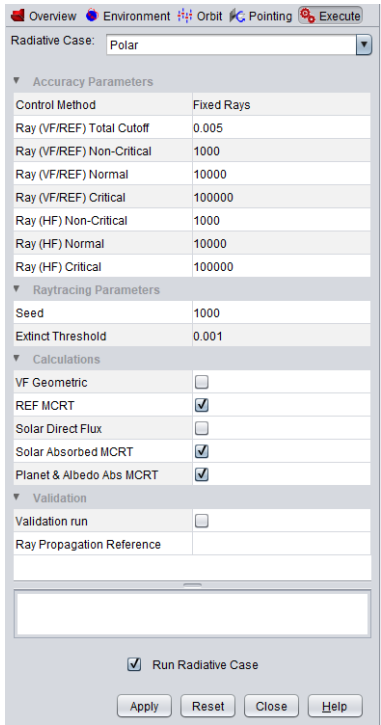


In addition, a new attribute called *Mass* is now available in the picking and information table. Based on the picking mode, the new attribute will report the mass in kg of the selected geometry.

Bulk Material	AlAl
Area (m2)	0.008
Mass (kg)	0.0108
Optical Coating	SSM["default"]

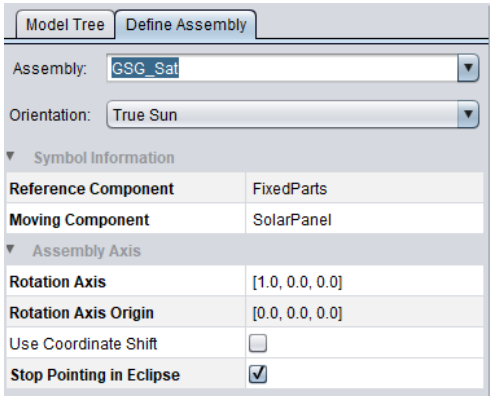
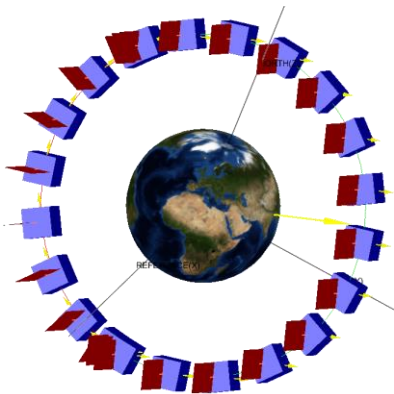
## Radiative – New execution dialog

The Execute Radiative Case dialog has been re-located to a separate tab within the Define Radiative Case dialog. The values specified within the Execute tab are stored when the Radiative Case is defined. These settings are used to execute the Radiative Case either when applying the Radiative Case definition if the “Run Radiative Case” checkbox is selected, or when the Execute option is selected from the right click menu or ribbon bar, or if the radiative case has missing results when an Analysis Case that uses the Radiative Case is applied.



## Radiative – Improved assembly pointing during eclipse

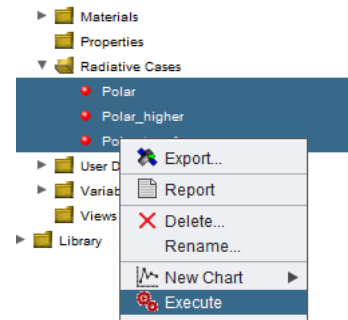
When a model goes into Eclipse, solar panels usually stop tracking sun and stay in the same position. ESATAN-TMS 2024 provides an option to stop the automatic assembly orientation settings rotating/pointing when in eclipse.



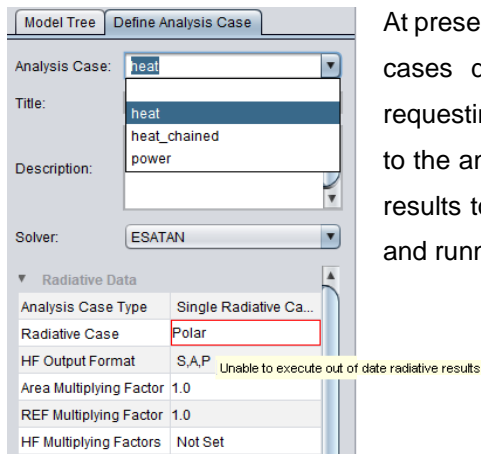


## Radiative - Running multiple radiative cases

At present each radiative case must be run separately from a separate request. This update will introduce the ability to request the execution of more than one radiative case in a single request. For example, by introducing a right click menu Execute option on multiply selected radiative cases. This will instantiate the Execute dialog. The settings of the Execute dialog will be applied to all selected radiative cases.



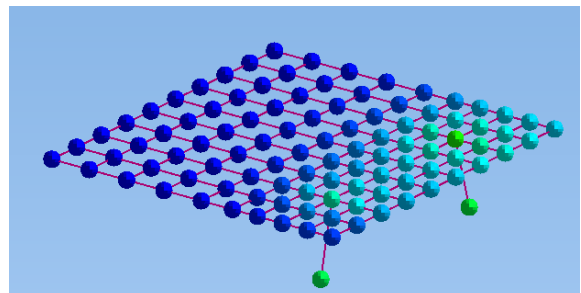
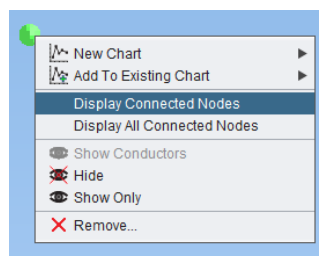
## Radiative – Improved solution from analysis case



At present an attempt to perform an analysis run when one of its radiative cases does not have up-to-date results will fail with a message requesting that the appropriate radiative cases be run first. This update to the analysis case will allow radiative cases with missing or out dated results to be executed before subsequently generating the analysis file and running the thermal analysis.

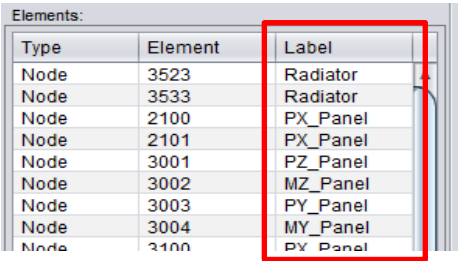
## Post Processing – Display connected nodes

From a selection of nodes in the Schematic chart, it is now possible to find and add nodes that are connected to the selection via conductors. The connected nodes option uses the displayed conductor types to find nodes that are either directly linked to the selected nodes by a conductor or those indirectly connected by one or more conductors.



## Post Processing – Chart label column

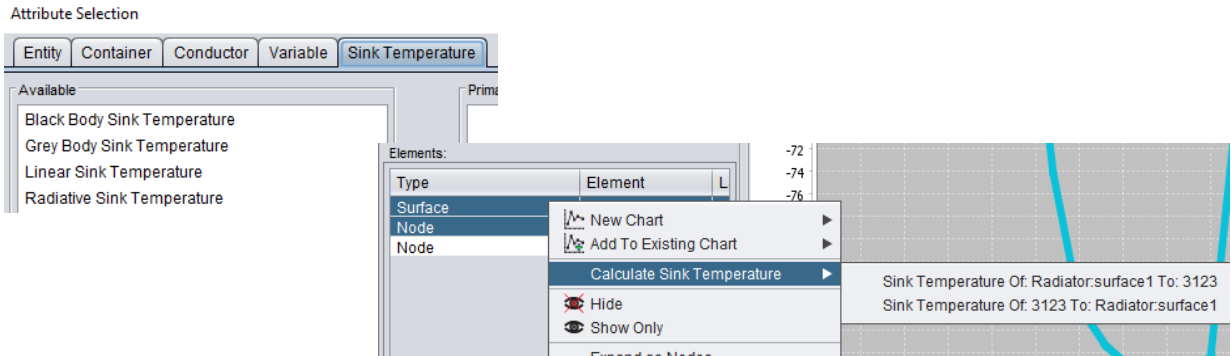
There is now an additional column representing the label in the Elements table of the Attribute, Heat, Delta and Schematic charts to assist with post-processing.



Type	Element	Label
Node	3523	Radiator
Node	3533	Radiator
Node	2100	PX_Panel
Node	2101	PX_Panel
Node	3001	PZ_Panel
Node	3002	MZ_Panel
Node	3003	PY_Panel
Node	3004	MY_Panel
Node	3100	PV_Panel

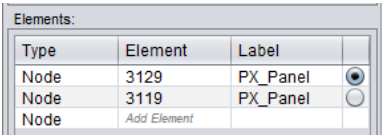
## Post Processing – New sink temperature attribute

In the attribute chart it is now possible to calculate and display the sink temperature of a node or a container to another node or container. Similar to the existing Thermal implementation, four types of sink temperature are available: black body, grey body, linear and radiative.

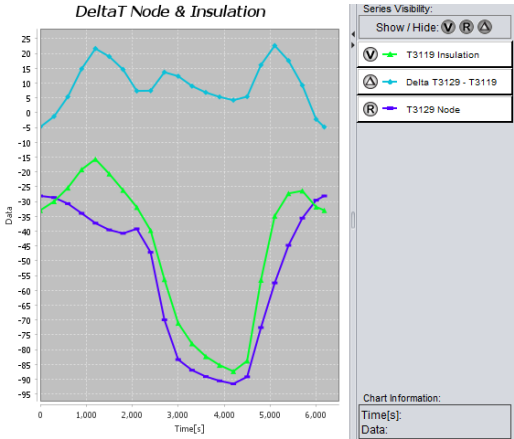


## Post Processing – New delta chart attribute

The delta chart has been improved to support delta between two elements for the same data source. Normally the delta chart compares two data sources for the same element, but sometimes there is a need to compare the insulation node to the structural node for instance, for the same data source. ESATAN-TMS 2024 now supports such a comparison.



Type	Element	Label
Node	3129	PX_Panel
Node	3119	PX_Panel
Node	Add Element	



# 3 Problems fixed

## *Workbench*

- 
- 1 Define real option should not be available from bulk or optical dialog fields when defining library symbols
  - 2 Contents of geometry colour field not being validated
  - 3 Reset breaks optical modal property dialog
  - 4 Analysis type of shell that is cut can be changed to Finite Element
  - 5 Preferences dialog freezes when model variable used in input field
  - 6 Workbench exits unexpectedly when displaying TMD file in display dialog and then dragging in an erg file to open a new model
  - 7 Small delay after selecting combine with a lot of shells (> 1000)
  - 8 Analysis Case Save button cannot be selected without Radiative Cases results
  - 9 Language defines a solid cylinder by parameter with an optical with non-zero transmissivity
  - 10 The DEFINE\_CONTACT\_ZONE reference manual page incorrectly states contact\_conductance is an optional parameter
  - 11 Maximum gap field of the contact zone dialog was incorrectly accepting a property name, field can only be defined using a real
  - 12 Entering 0.0 into a thickness field in geometry dialog clears the field
  - 13 Memory leak in automatic conductor generation
  - 14 Most matrix dialogs show "delete row/column" even with 1 row/column
  - 15 Memory leak when re-defining string vector
  - 16 Integer and Real dialogs give unintuitive error about dependencies with unset field
-

- 
- 17** Workbench exits unexpectedly validating a real expression
  - 
  - 18** Unable to show group overlay error when closing model
  - 
  - 19** Inconsistent validation in property dialog
  - 
  - 20** Opening property dialog with WORKBENCH\_V0 can unbind WORKBENCH\_V1 matrix entries
  - 
  - 21** Workbench exits unexpectedly when attempting to post-process from a GFF file
  - 
  - 22** Extract executable not supplied on Linux
  - 
  - 23** Update reference manual for changes to error\_code parameters
  - 
  - 24** Defining an assembly with 'General' orientation causes ESATAN-TMS to exit unexpectedly
  - 
  - 25** Model property with library matrix shouldn't attempt to change matrix
  - 
  - 26** Error writing configuration file when ESATAN\_TMS\_HOME folder does not exist
  - 
  - 27** Modal property fields warn about dependence even if the property doesn't exist
  - 
  - 28** Delete thermo-optical property environment error messages aren't useful
  - 
  - 29** Symbols that assemblies depend on can be deleted without warning
  - 
  - 30** Hierarchies (inc. assembly) don't get an invalid X icon
  - 
  - 31** Unexpected exit in combine and cut language statements if a matrix or vector geometry element is accessed outside of its bounds
  - 
  - 32** Python API declares optical when definition is invalid
  - 
  - 33** Python API declares user defined conductor when definition is invalid
  - 
  - 34** Generate analysis file can exit unexpectedly when using format strings in parametric expressions
  - 
  - 35** Combine and Cut dialog does not list descendant geometry symbols
  - 
  - 36** Bound point vector/matrix elements are not being updated when changed
-

- 
- 37** Conductor dialog only resets to default for current conductor type
- 
- 38** Solar constant value of zero reported for an ephemeris-based radiative case before it is executed
- 
- 39** Memory error referencing deleted symbol may cause ESATAN-TMS to exit unexpectedly
- 
- 40** When picking LP nodes in LP nodes dialog, key show/hide operates at the geometry and not face level
- 
- 41** ESARAD\_GENERATED state is not being reset in GUI when using command history
- 
- 42** Attribute .COND is not recognised when material is defined as a user library material
- 
- 43** Conductors not re-calculated if a group used in a contact zone is updated
- 
- 44** "Display Contact" shades non-contacting faces
- 
- 45** Delete option in right-click menu not always at the same place on the menu
- 
- 46** LP Thermal Nodes dialog replaces all submodels interval with main model interval only in some cases
- 
- 47** Potential incorrect area value output in the information table after picking on a cut geometry
- 
- 48** Analysis case cannot be created or run when switching from 'Chained Radiative Cases' to 'Single Radiative Case'
- 
- 49** Radiative Results Report Always Says 'Not in Cavity'
- 
- 50** Copy model/save as not renaming ray propagation ref on radiative cases
- 
- 51** Post Processing Export to CSV Displays Incorrect Time Label
- 
- 52** Boundary condition heater references can exceed ESATAN line length of 256 characters
- 
- 53** Calling DEFINE\_GEOMETRY\_ATTRIBUTES and setting ndelta to a valid value fails with warnings
- 
- 54** Exception occurs selecting a series in a Radiative Attribute Chart displayed using the min max chart style
-

- 
- 55** Copy assign combine containing pipe to another pipe causes Workbench to exit unexpectedly
- 
- 56** Calculating conductors can slow down if a significant number of pop-up errors messages are generated
- 
- 57** Literal optical values output incorrectly in exported model and log file
- 
- 58** Symbol incorrectly moved out of user folder when redefining
- 
- 59** Exception clicking graph in property dialog with blank data
- 
- 60** Workbench exits unexpectedly when double clicking pipe using literal optical
- 
- 61** Analysis case and radiative case opening in GUI can enter infinite loop if dependent symbol is invalid.
- 
- 62** Language for Solid Cone by points accepts invalid definition with collinear points
- 
- 63** Defining a pipe from the language doesn't return an error\_code to user
- 
- 64** String dialog inconsistently lists vector and vector[size]
- 
- 65** Python API get\_attribute doesn't fail when given unexpected parameters
- 
- 66** Invalid data in the ".esaradrc" file can cause ESATAN-TMS to exit unexpectedly
- 
- 67** Error message about displaying key may be output when API model closes.
- 
- 68** Shell disc and sphere definitions by directions are not validating direction of radius.
- 
- 69** Warning from modal Real dialog when requested to load a Property symbol
- 
- 70** Picking and Properties Table may report incorrect face colour in Attribute Value field
- 
- 71** Python API Optical attributes generate spurious errors messages when an optical is invalid
- 
- 72** Define transform doesn't copy assemblies properly
- 
- 73** Area override parameter is not validated in convective conductors for wall to fluid conductors
- 
- 74** Errors in calculation of Sun position (Radiative case Environment tab)
-

- 
- 75** Define Geometry Attributes language statement rejects bulk and analysis type change that is accepted by dialog
- 
- 76** Define assembly dialog outputs define language before declaration statement to log file
- 
- 77** Error message output for shell thickness wrongly refers to integers
- 
- 78** Combine and Cut dialog doesn't always generate an error on combines
- 
- 79** Incorrect cutting operation applied
- 
- 80** ESATAN-TMS exits unexpectedly when redefining an assembly
- 
- 81** Display of Node Numbers is not handling geometry rename or delete operations
- 
- 82** Generate Analysis File exits unexpectedly with duplicate node numbers
- 
- 83** Delta chart will no longer support setting multiple difference reference data sources
- 
- 84** Exported model loses prefix from combined geometry
- 
- 85** Error importing from STEP-TAS models containing cutting operations
- 
- 86** Radii at aphelion/perihelion are labelled the wrong way round
- 
- 87** Include Model incorrectly prepends ":" to Boundary Condition and User Defined Conductors that reference a thermal node with a submodel
- 
- 88** Referenced points get deleted if the "Referenced by" warning dialog is opened from the Visualisation window and is closed without selecting an option.
- 
- 89** Calling Python API get\_attribute with an enclosure radiative case and supplying a non-enclosure attribute produces an incorrect error message
- 
- 90** Exception when closing model if a surface has been left selected in define surface attributes dialog
-

## *Thermal*

- 
- 1 Potential issue with scaling heat flux factor when using the acd file
  - 2 Issue with acd file when global file path is too long
-



## 4 Points to note

- 
- 1 The developments undertaken for ESATAN-TMS 2024 have required an update to the model store format. Models will therefore be updated from the ESATAN-TMS 2023 format when first opened in ESATAN-TMS 2024.
  - 2 In previous versions, the shell definition language statements have defaulted the optical parameter for side 2, 'opt2' to the optical parameter provided for side 1, 'opt1' when no value is supplied for 'opt2'. In this version this default for 'opt2' has been removed.
  - 3 The Python API description attributes BulkAttribute.DESCRPTION and OpticalAttribute.DESCRPTION should now be replaced by CommonAttribute.DESCRPTION. In a future release the BulkAttribute and OpticalAttribute DESCRIPTION will be removed.
  - 4 The Python API RadiativeEnvironmentAttribute.CELESTIAL\_BODY\_IMAGE will no longer support cases for which it previously returned CelestialBodyImage.SUN. Instead the attribute RadiativeEnvironmentAttribute.ORBIT\_CENTRE can be checked against OrbitCenter.SUN to determine if the case is sun centred.
  - 5 Delta chart will no longer support setting multiple different reference data sources.
-

# 5 Migrate from previous version

**ESATAN-TMS Workbench** provides a smooth upgrade path from ESATAN-TMS 2022 and ESATAN-TMS 2023.

On launch of Workbench, ESATAN-TMS checks the version of the associated user-library file (if present), and prompts to update the library. On opening the model, Workbench checks the model version number and, if a model from one of the versions listed above is detected, the option is given to automatically update the model to the new version.

Note that the upgrade of the model and the user-library is a permanent update and therefore after the update the files will not open in the previous version. It is therefore recommended that a copy of the model and the user-library file be made before proceeding with the update.

## 6 Contact information

If you have any questions regarding the new version or require further information, please contact our customer support at:

### ESATAN-TMS User Support



+44 (0)116 284 5748



[support@esatan-tms.com](mailto:support@esatan-tms.com)



[www.esatan-tms.com](http://www.esatan-tms.com)

*ESATAN is a trademark of ITP Engines UK Ltd.*