

Marine Weight Schedule - User Manual

Introduction

Marine Weight Schedule is a plugin for Rhino 3D designed to generate - from a vessel's 3D model - a bill of masses/inertias, as well as a Bill Of Materials. It take in account points, curves, surfaces, solids and blocks, and use the parameters from the layers names to apply the unitary/lineic/surfacic/volumic masses, with a margin percentage applied.

A command is also provided to generate an hydrostatic report at a given height interval (based on Rhino hydrostatics features)

Both reports will be generated as excel files (.xlsx) based on a customizable template, but microsoft excel doesn't need to be installed on the computer.

Plugin installation

Overview

The plugin installer can be downloaded at: <https://www.tomkod.com/product/marine-weight-schedule/>
A free trial is included, and yearly licenses can be purchased on the aforementioned page.
Marine Weight Schedule works for Rhino 6¹⁾ and Rhino7²⁾.

Yak

Our plugins are also compatible with Yak, Rhino's new package manager ³⁾, which is basically an application store for Rhino. You just need to call Rhino's command **PackageManager**:



You can also install from the repository with the following command line:

```
"D:\Program Files\Rhino 6\System\Yak.exe" install 'PluginName'
```

If you add this in a batch file (*.bat) at windows startup, it is probably the best way to keep all your plugins up-to-date 😊



```
C:\WINDOWS\system32\cmd.exe

C:\>"C:\Program Files\Rhino 6\System\Yak.exe" install PluginName
Downloading PluginName (X.X.X)...
Downloaded PluginName (X.X.X)
Installing PluginName (X.X.X)...
Successfully installed PluginName (X.X.X)

C:\>
```

License activation

Prerequisites

The free evaluation can be used once per computer, and requires network access to www.license.tomkod.com

The license activation requires network access to www.tomkod.com

Please check your firewall in case of failure.

Activation form

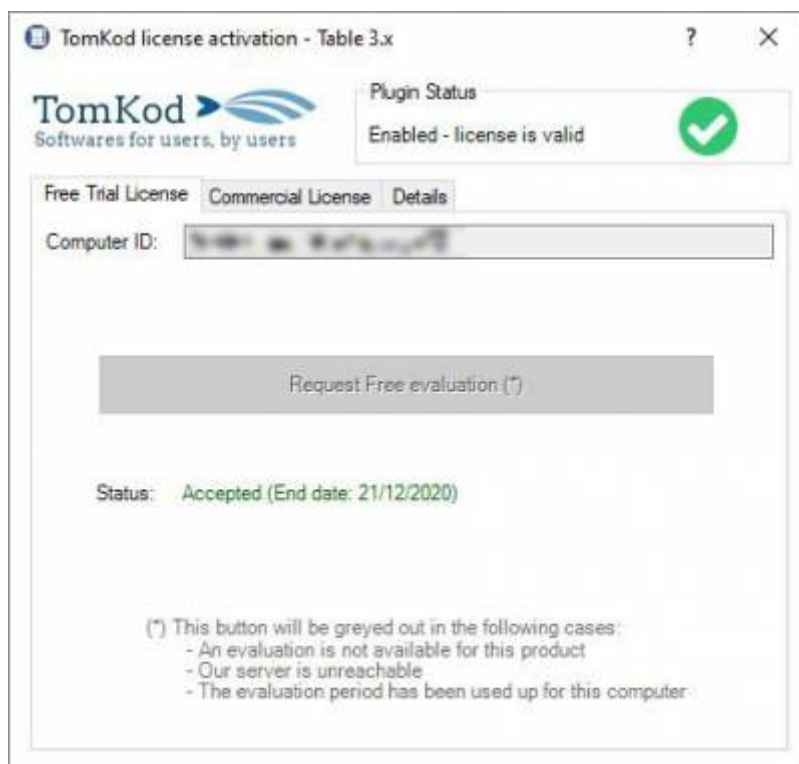
The activation window automatically shows up when the plugin is loading and a valid license or trial is not registered. If you want to see, change or remove your license while the plugin is already loaded, you can use the Rhino commands **PluginName_License**.

Activation status is always visible on the upper right corner of the form, if the icon is green your plugin will be enabled:



Trial Tab

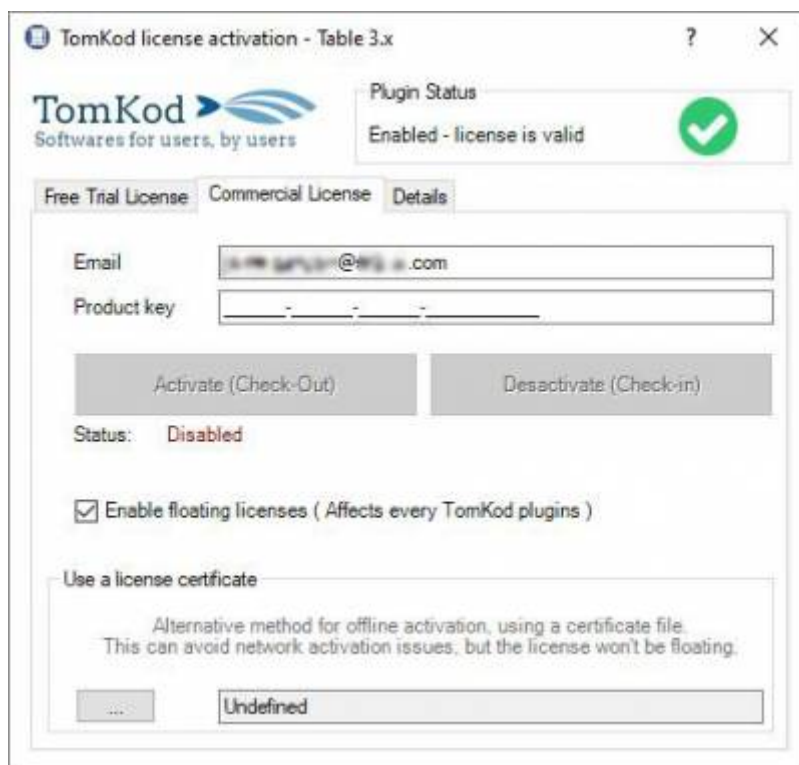
This first tab is dedicated to the trial requests. Your trial status is displayed, and the button is disabled if a trial is not available for your computer (Your trial has already been activated, or the server is unreachable)



Commercial Tab

This tab's two main buttons let you Check-out (Activate) or Check-in (Desactivate) your license from

our license server.



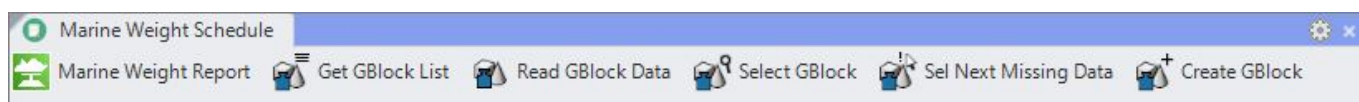
When the checkbox *“Enable floating licenses”* is checked, every TomKod's plugin will try to deactivate the license automatically when closing (Making it available for another of your computers)

Finally, a license certificate (*.TkLic) can be selected at the bottom of this tab. It allows to activate a license offline, but the license won't be floating anymore. If you need one, contact us at <https://www.tomkod.com/contact/>

Toolbar

The toolbars for Rhino are always included in your plugins installation directory, or can be downloaded [here](#).

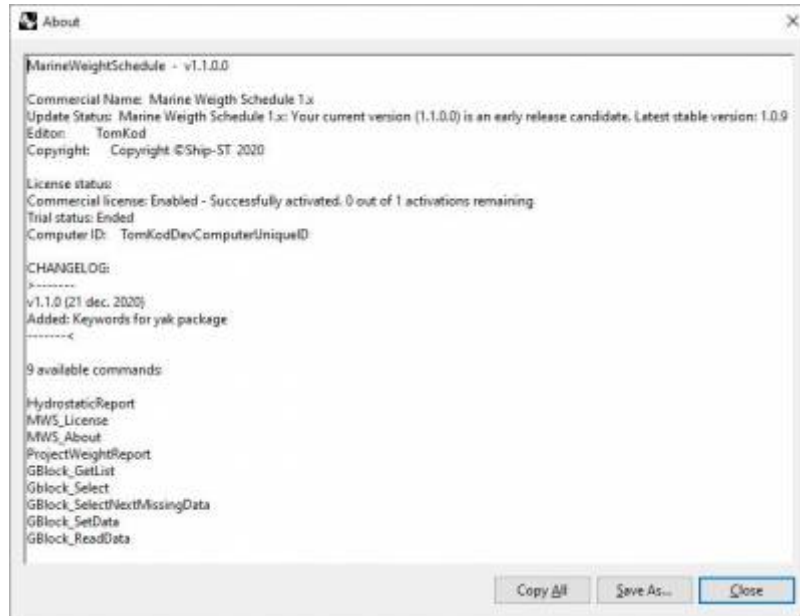
You just have to drag/drop the file “Tomkod.rui” to a rhino window to install them.



Features and commands

MWS_About

This command can be used only from the command line prompt. It displays the plugin's current revision and license status.



MWS_License

This command can be used only from the command line prompt. It displays the plugin's activation form.

See [license_activation](#).

ProjectWeightReport

Computes the whole model masses, as well as a Bill Of Materials⁴⁾ and generates an excel report.

Walkthrough

For each layer⁵⁾, the command will retrieve the *Mass*, *Margin* and *Vertical offset* values from the layer name⁶⁾, then:

1. For each rhino object, the actual mass and gravity center will be computed, using the layer values. The layer's *Mass* will be used differently, depending on the object's type: ponctual mass for Points, lineic mass for curves, surfacic mass for surfaces⁷⁾, and volumic mass for closed polysurfaces.
2. At the same time, the Bill-of-Materials will be created internally.
3. An excel report will be created.



Model preparation

The fundamental idea of this plugin is to match data from the model's objects and their layer. For this reason, each layer should contain only one specific material. *For example:*

- The layer **Deck1:SectionB:Nuts** could contain only points, and the layer's (*mass*) information would be used as a ponctual mass for each nut.
- The layer **Deck1:SectionB:plates** could contain only surfaces, and the layer's (*mass*) information would be used as a surfacic mass for each plate.

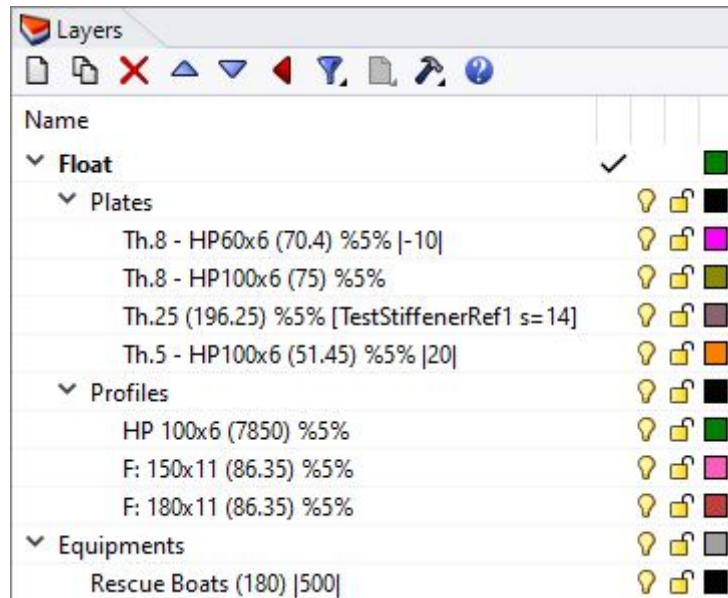
Layers naming convention

The document's layers should follow the following naming convention:

LayerName (Mass) %Margin% |VerticalOffset|

where:

- **Mass** will be the ponctual/lineic/surfacic/volumic mass
- **Margin** (optional) will be the percentage to add to the object's mass.
- **VerticalOffset** (optional) will be the the vertical offset to apply to the layer's masses



Particular case for Stiffeners

A specific naming convention has been added to properly count the stiffeners in the Bill-of-Materials, to consider the scenarii explained below.



Those particular cases only impact how materials will be counted in the Bill-of-Material tab. The weight report results won't be impacted.

• Implicit stiffeners

There are some cases where you don't want/need to create an actual geometry for your structure stiffeners, for example when you are at the early stage of your project. *Implicit stiffeners* let you count the required stiffener lengths relative to the layer's metal sheet's areas.




```
LAYERNAME: MyLayerName (Mass) %Margin% |VerticalOffset| [StiffenerName s=value]
```

In the Bill-of-Material, this would create two outputs: an area for the surfaces in "MyLayerName", and a length for their stiffeners.



'StiffenerName Length' = 'MyLayerName Area' / s

For example:

Th.6 (56.9) %5% [HP80x6 s=49.05]   

• Stiffeners defined as curves in the model

Two kind of curves-defined stiffeners can be used:

- Folded plates

LAYERNAME: W:120x6 BF60

This will be counted as one surface, Thickness 6, width=120+60. Thus the result in the Bill-of-materials will be:



'Th.6 plate Area' = length x (120+60)

- Profile with flat plate

W:120x6 F:80x8

This will count as one surface, Thickness 6, width=120, plus one profile 80x8



In this case, the command will output an area for the plate, and a length for the profile:

'Th.6 plate Area' = length x 120

'80x8 profile length ' =length

• Stiffeners defined as surfaces in the model

In some cases, you might want to represent your stiffeners as a 3D surface in the model, but count them as lineic outputs in the Bill-of-Materials because they are technically profiles.

LAYERNAME: F:80x8

This would output:



'80x8 profile Length' = area / 80

As for the weight estimate, the layer's optional %Tolerance% will be considered:

LAYERNAME: F:80x8 |34.1| (87.2) %3.4%

This would output:



'80x8 profile Length' = (area / 80) + (area / 80) * 3.4/100

Particular case for Blocks

By default, rhino® blocks⁸⁾ are ignored by the command. However we provide several commands to transform blocks into GBlocks, which are considered in the reports as ponctual masses.

See [gblock_setdata](#)



When the command will process GBlocks, their layer properties will be ignored, and the Gblock's internal definition will be used instead (Name, gravity center, mass).

Output

When the whole model has been processed, an excel⁹⁾ report is generated, and the user is invited to pick a name and location for the resulting file. Bill of masses main sheet:

H31									
TomKod Softwares for users, by users									
PROJECT : xxx MASS SUMMARY-re0									
Customer :									
Last update: 05/01/2021 (15:13)									
Reference: DEMO_Project\WeightReport.3dm									
Masses Inertias									
Item	Mass (kg)	Xg (mm)	Yg (mm)	Zg (mm)	Ixx (kg.mm²)	Iyy (kg.mm²)	Izz (kg.mm²)		
Volumic Masses	256	-62	-821	1739	4756536917	60400264,6	7,878E+10		
Surfacic Masses	69623	-19	150	2211	2322883807	3,0123E+13	2,5896E+10		
Lineic Masses	0	0	0	0	0	0	0		
Ponctual Masses	2611	2125	-93	3408	18519817,8	1566596693	2,1869E+11		
Total	72489	58	138	2252	1,116E+10	3,014E+13	3,3532E+11		
Huggens Theorem									
New point's coordinates :				New Inertia					
Xs=	0	Ixx=	380 262 010 791						
Ys=	0	Iyy=	30 508 174 810 857						
Zs=	0	Izz=	336 945 050 974						
Results									
Volumes Surfaces Curves Points BillOfMaterials									

Bill of masses detailed sheets for Volumes, surfaces, curves and points:

A2

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

TomKod

Softwares for users, by users

PROJECT : DEMO

MASS SUMMARY-re0

Customer :

Last update: 18/02/2021 (13:49)

Reference: DEMO_ProjectWeightReport_v2.3dm

BILL OF VOLUMIC MASSES									Volumes inertia			Masses inertia		
Item	Volume (mm³)	Volumic mass (kg/m³)	Margins	Mass (kg)	Xg (mm)	Yg (mm)	Zg (mm)	Ixx (mm⁴)	Iyy (mm⁴)	Izz (mm⁴)	Ixx (kg.mm⁴)	Iyy (kg.mm⁴)	Izz (kg.mm⁴)	
Bi-Metal	4.13E+07	53	0.0%	2	-214	-5261	2958	8.23E+12	1.96E+15	1.97E+15	4.36E+05	1.04E+08	1.04E+08	
Steel.Profiles:Round Ø20	2636208	7850	5.0%	22	-165	4874	4150	1.25E+12	1.93E+12	1.75E+12	1.03E+07	1.59E+07	1.44E+07	
Float.Profiles:HP 120x6	1.45E+07	7850	5.0%	120	0	0	1691	1.81E+14	2.65E+15	2.83E+15	1.49E+09	2.19E+10	2.33E+10	
Float.Profiles:HP 100x6	1.15E+07	7850	5.0%	95	-296	-469	1758	6.96E+13	8.70E+14	9.34E+14	5.74E+08	7.17E+09	7.70E+09	
Float.Profiles:HP 200x10	2.51E+07	7850	5.0%	207	2	-807	1407	7.60E+13	3.00E+15	3.06E+15	6.27E+08	2.48E+10	2.52E+10	
Float.Profiles:Round Ø30	7526622	7850	5.0%	62	0	-4874	2005	2.54E+12	2.49E+15	2.49E+15	2.09E+07	2.05E+10	2.05E+10	
				507.8957	-62.3991	-820.693	1739.091				4.76E+09	7.46E+10	7.88E+10	

Results

Volumes

Surfaces

Curves

Points

BillOfMaterials

TomKod

Softwares for users, by users

PROJECT : xxx

MASS SUMMARY-re0

Customer :

Last update: 05/01/2021 (15:13)

Reference: DEMO_ProjectWeightReport.3dm

BILL OF PONCTUAL MASSES

Item	Points quantity	Ponctual mass (kg)	Margins	Mass (kg)	Xg (mm)	Yg (mm)	Zg (mm)	Points inertia			Masses inertia		
								Ixx (mm ⁴)	Iyy (mm ⁴)	Izz (mm ⁴)	Ixx (kg.mm ⁴)	Iyy (kg.mm ⁴)	Izz (kg.mm ⁴)
Equipments # Tesla model R	2	2300	0.0%	4600	2291	294	3416	5810375	63113833	68924208	13363861587	145161816500	158525678098
Equipments # MissingData - Bike Harley	1	0	0.0%	0	0	0	0	0	0	0	0	0	0
Equipments:Rescue Boats	2	180	0.0%	360	0	-5041	3308	0	2,72E+08	2,72E+08	0,00E+00	4,89E+10	4,89E+10
				4960	2124.514	-93.28	3408.451				2,29E+10	1,96E+11	2,1869E+11

Results

Volumes

Surfaces

Curves

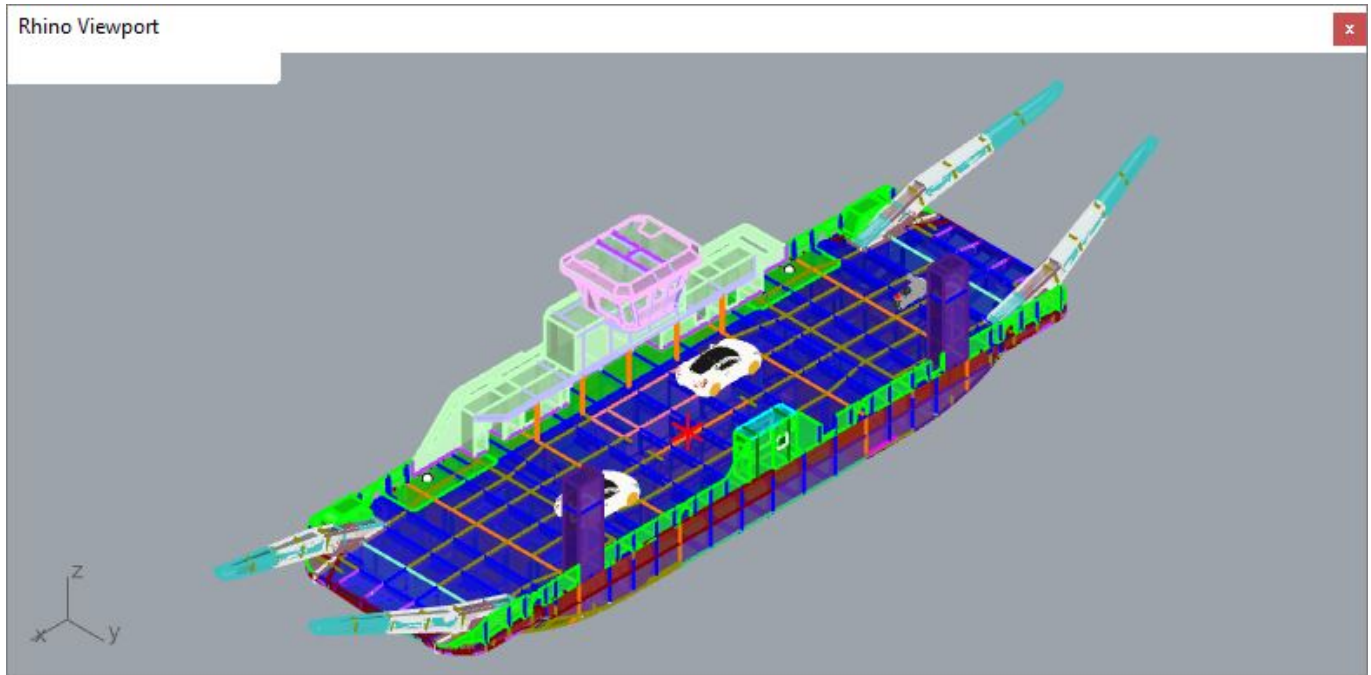
Points

BillOfMaterials

Bill of materials:

A	B	C	D	E	F	G	H
1	TomKod		PROJECT : xxx				
2	Softwares for users, by users		MASS SUMMARY-re0				
3			Customer :				
4	Last update: 18/02/2021 (13:49)						
5	Reference: DEMO_ProjectWeightReport_v2.3dm						
6							
7	BILL OF MATERIALS						
8							
9							
10	LAMINATED PLATES						
11							
12	F: 100x11	22394979.1	mm³				
13	F: 100x8	3538524.77	mm³				
14	F: 120x11	5090566.62	mm³				
15	F: 150x11	5511497.29	mm³				
16	Th.6	103378740	mm³				
17	Th.8	255121521	mm³				
18							
19	EXTRUDED PROFILES						
20							
21	100x10	16045.2844	mm				
22	60x6	9000.31597	mm				
23	80x10	53421.4513	mm				
24	80x6	26671.4546	mm				
25							
26	OTHERS						
27							
28	Equipments # Bike Harley	1					
29	Equipments # Tesla model R	1					
30	Rescue Boats	2					
31	Results Volumes Surfaces Curves Points BillOfMaterials						

A custom ViewPort is created with the gravity center displayed:



Options

No option available.

Customization

The excel report template "PWE_Model.xlsx" can be modified in the plugin's install directory, usually:

`%AppData%\McNeel\Rhinoceros\7.0\Plug-ins\Marine Weight Schedule for RH6-RH7
(dac6da37-23fc-4ad6-9b46-33a2cad9e13b)\VersionNumber`

It is recommended to edit only the texts values and the logos, while keeping the document general layout.

HydrostaticReport

Computes an hydrostatic analysis at different heights and generates an excel report.

Walkthrough

The hull's surface or polysurface is selected as input. Once validated, Rhino's hydrostatic culculation is runned at various heights as defined in options, and an excel report is generated.

	A	B	C	D	E	F	G	H	I	J	K	L
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												

Options

TEMin	Minimum height (mm)
TEmax	Maximum height (mm)
Delta	Distance between two tested height (mm)
Density	Water Density
AutoMinMax	Detect TEmin and TEmax values from geometry (Only available when a geometry is selected)

Customization

The excel file template can be edited in the plugin install directory.

GBlock_GetList

Lists every existing GBlock names and masses to the command line.

Walkthrough



Todo

GBlock_ReadData

Read a GBlock data.

Walkthrough



Todo

Gblock_Select

Select a block by their GBlock Name. (From a list of available GBlock names)

Walkthrough



Todo

GBlock_SelectNextMissingData

Select the next block in the document where gravity center and mass are undefined

Walkthrough



Todo

GBlock_SetData

Add gravity center and mass informations to a block. GBlocks are considered by the command *ProjectWeightReport* , which makes them extremely useful for your equipments.

Walkthrough



Todo

¹⁾

Rhino6.15 or later

²⁾

Tested up to Rhino 7.1

³⁾

Rhino 6 or later only, with graphic user interface for Rhino7 only

⁴⁾

v1.0.4 and later versions

5)

The whole model or worksession will be used

6)

Read "Model preparation" below

7)

To avoid errors, opened polysurfaces won't be allowed

8)

instances references

9)

.xlsx

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