



USER DOCUMENTATION

Tekla Structures - 3D Optimisation Project (Phase IV)

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[TEKLA STRUCTURE- 3D OPTIMISATION PROJECT PHASE IV] USER DOCUMENTATION

Tekla Billboard Aid

— □ ✕

A

Board Parameters Add Ons

LED Cabinets
Add Edit

☒ Row
 ☐ Column

☒ Curved
 Radius

Add
Add Split

Screen Height (mm) 0
 Screen Length (mm) 0

Rows: 0 Columns: 0

Frame Structure
Add Edit

Upper Railing Spacing
 Lower Railing Spacing

Back Horizontal Beams
☒ Auto ☐ Manual
Add

Upper Waler Spacing
 Lower Waler Spacing

Walsers
☒ Auto ☐ Manual
 No. Walsers
Add

Features
 Welding Offset

Diagonal Beam
 Corner Offset
 Top Offset
 Bottom Offset

LED Screens

Depth (mm)
 Width (mm)
 Height (mm)
 Weight (Kg)
 Density (kg/m3)

Galvanising Bath
Location: GB Dandenong (VIC) ▾

Length:
 Width:
 Depth:

J

Billboard Dimensions

Overall Height
 Overall Length
 Overall Depth
 Overall Weight

K

Screen Gaps

Screen Gap (Top)
 Screen Gap (Bottom)

L

Cabinet Bolts

Bolt Horizontal Offsets
 Bolt Vertical Offsets
 Bolt Diameter

M

Bracket Bolts

Bolt Standard
 Bolt Diameter
 Hole Diameter

N

Material and Profile
O

	Material	Profile	
LED	digital1.0	PLT170	
C1	C350L0	RHS75*50*4.0	Select...
B1	C350L0	SHS75*75*4.0	Select...
B2	C350L0	RHS75*50*4.0	Select...
B3	C350L0	SHS50*50*3.0	Select...
B5	C350L0	SHS65*65*4.0	Select...
BR1	C350L0	SHS50*50*3.0	Select...
Waler	C350L0	SHS75*75*4.0	Select...
Seating Plate	250	FL8	
EA Support	C350L0	EA50*50*5	Select...
Z bracket	250	PLT12*75	Select...

Split Beams
P

	Material	Profile	
C1	C350L0	RHS75*30*4.0	Select
B1	C350L0	RHS75*25*4.0	Select
B2	C350L0	RHS75*25*4.0	Select
B5	C350L0	RHS65*35*4.0	Select

EA Connecting Bolt

Offset
 EA Cabinet Bolt Hole Size

Q

Seating Plate

☒ On ☐ Off
 Plate Offset Extrusion

R

Walkway Mesh

Walkway Thickness
 Walkway Material
 Walkway Clearance
 Walkway Width
 EA Support Clearance

T

Z Bracket

Middle Bracket
 Z bracket Spacing a
 Z bracket Spacing b

U

End Bracket

Z bracket Spacing a
 Bracket Spacer Plate Thickness

☐ On

Side View 1

Side View 2

Front View

Top View

Walkway Railings
 KneeRail HandRail Trimmer:

V

Part Prefix
 Assembly Prefix

Validate

Build

Save

Load

W
X
Y
Z

A: Page select

The Page selector allows the user to switch between modifying the parameters of the billboard and adding/removing “Add Ons” from the billboard.

B: Add/Edit LED Screens tab

These tabs switch between the user adding LED cabinets to modifying or removing already existing inputs for cabinets.

C: Rows, Columns and Radius User Input

The radio buttons select whether to add a row or column.

The desired height or width of the row or column (respectively) can be input into the text box, and then added to the row/column list with the ‘Add’ button.

When a row/column is selected in the list, ‘Add Split’ will mark that entry with an asterisk (*) to denote that the billboard will be split between that row/column and the next.

The Curved checkbox must be selected when a curved billboard is desired.

The empty text box under “Radius” is where the user should enter the desired radius of the LED Screen in mm.

D: Rows, Columns and LEDs Display

The two boxes show the lists of row/column lengths that have been added. Items in the lists can be selected to modify the length or add/remove a split.

The total height and length of the screens is displayed to the right.

E: Horizontal Railing Parameters and Input

The spacing of the highest railing from the top and the lowest railing from the bottom can be set. The radio buttons select whether other horizontal railings will be added and positioned automatically or using heights from a user input list. If 'Manual' is selected, railing positions can be input into the text box as heights from the bottom of the billboard, then added to the list by clicking the 'Add' button.

F: Waler Parameters and Input

The spacing of the highest waler from the top and the lowest waler from the bottom can be set. The radio buttons select whether walers will be added and positioned automatically or using heights from a user input list.

If 'Manual' is selected, waler positions can be input into the text box as heights from the bottom of the billboard, then added to the list by clicking the 'Add' button.

H: Diagonal Bracing Offsets

Position offsets for the diagonal bracing beams are set here.

The corner offset controls how far from the corners of the frame the diagonal beams should start and end. The top and bottom offsets control how far the diagonal beams on the top and bottom faces (respectively) of the billboard or box are offset towards the centre of the box.

I: LED Screen Parameters

The depth and average density of the LED screens are set here.

Modifying these values also updates the material and profile shown in the list of member profiles.

J: Galvanising Bath Selection

The gal bath location can be selected from a dropdown list.

The dimensions of the gal bath at the selected locations are shown below.

K: Billboard Dimensions Display

The dimensions of the final billboard model are displayed here. This display updates when the model is built (by clicking the 'Build' button).

L: Screen Gap Offsets

The offsets of the screen cabinets from the top and bottom sides of the billboard are set here. The offsets given are from the inside edge of the top and bottom beams, with the positive direction moving towards the centre of the billboard.

M: Cabinet Bolt Parameters

The position offsets and diameter of the cabinet bolts are set here. Cabinets have four bolts, one in each corner, and the offsets control the distance from the edges of the cabinet.

N: Bracket Bolt Parameters

The standards and diameter of bolts for the Z and Brody brackets are set here.

O: Member Profiles

Materials and dimensions of the structural members are set here. The material and profiles names/format should match the desired material and profile from the user's Tekla Structures material catalogue.

The LED screen material is a custom material inserted into the material catalogue when the model is built.

P: Split Profiles

Materials/dimensions of the structural members around a split point are set here.

Q: EA Support Split Parameters

If EA supports are used for the members along a horizontal split, these parameters are used to position their connecting bolts (as an offset from the vertical beams on either side) and a hole to allow cabinet bolts to pass through.

R: Seating Plate parameters

The radio buttons control whether seating plates will be modelled or not. If set to 'On', the position offset and extrusion length of the seating plates are set in the text boxes to the right.

S: Reference Drawings

These reference drawings show which members in the model each named profile refers to. They also show which dimensions the Z-bracket offsets refer to.

T: Walkway Parameters

Walkway parameters, including their dimensions and material, are set here.

U: Z-Bracket Parameters

Spacings between the Z-Bracket and walers can be set here. The thickness of an optional spacing plate can also be set.

V: Walkway railing settings (curved billboards)

In this section you can input the distance of the knee railing from the top of where the walkway begins in mm. You can also input the distance of the hand railing from the knee railing in mm. In the third and final text box you can input the maximum gap for trimmers in mm.

W: 'Validate' Button

When clicked, the program will check that all given inputs are valid and compatible with each other, then enable the 'Build' button. If any inputs are invalid, an error message will be displayed, and the 'Build' button will not be enabled. If any inputs are potentially incompatible, a warning message will be displayed, but the 'Build' button will still be enabled.

X: 'Save' Button

When clicked, the program will open a saving window for user to save all the input values as a .json file, user can choose the location of the saving file.

Y: 'Build' Button

When clicked, the program will compile and produce a BIM model based on the user's inputs, which will be output to Tekla Structures. Note that the program does not check if the model is structurally sound from an engineering standpoint, and it is up to the user to ensure the model is appropriate and make any necessary changes.

Z: 'Load' Button

When clicked, the program will open a load window for user to load their saved .json file with all the saved input value and apply them to the software.

[TEKLA STRUCTURE- 3D OPTIMISATION PROJECT PHASE IV] USER DOCUMENTATION

Tekla Billboard Aid

Board Parameters Add Ons

1

Camera Arm

☒ Top Side ☐ Bottom Side ☐ None

Camera offset from left side:

☒ Camera Arm Centre

Horizontal Arm Length:

Vertical Arm Length:

Angle From Level:

2

Fascia Box

☐ Enable Fascia Box

Fascia Box Height:

☒ 2D ☐ 3D

3

Ladder and Hatch

☒ Left Side ☐ Right Side ☐ None

Ladder Offset from Back:

Ladder Offset from Side:

Rung Diameter:

Rung Spacing:

Plate Height:

Ladder Width:

Hatch Width:

	Material	Profile	Select...
Rail:	C350L0	FL65*12	Select...
Rung:	C350L0	D20	Select...
Plate:	C350L0	PLT10	Select...
HatchBeam:	C350L0	RHS50*30*4.0	Select...

4

Lifting Points

Add Edit

☒ Top ☐ Bottom ☐ Both

Add

Upper: 0 Lower: 0

5

6

7

Walkway position

Add Edit

Distance from Bottom:

Add

Count: 0

8

9

10

Back Bracing (IN - PROGRESS)

☒ Enable

11

Cladding

Side:

Profile:

Colour:

Length:

Thickness:

Open Area (%):

Size:

12

Offset From Top:

Overall Sheet Width:

Overlap:

Effective Cover Width:

13

Galvanising Holes

☐ Auto ☒ Manual ☐ None

Closed-end offset

Offset2

Hole Size

Open-end offset

Offset1

14

Flashings

☐ Enable Flashings

Colour:

Thickness:

☒ Auto ☐ Manual

15

Top Bottom Sides

16

17

Rear Door

☒ Enable Rear Door

Door Offset from Left:

Door Width:

Door Minimum Height:

Frame-Panel Distance:

	Material	Profile	Select...
Door Frame Beam:	C350L0	SHS75*75*3.0	Select...
Door Panel Beam:	C350L0	SHS25*25*3.0	Select...

Part Prefix

Assembly Prefix

Validate Build Save Load

1: Camera Arm Parameters

The camera arm has its parameters set here. The radio buttons control whether an arm is attached to the top or bottom of the billboard, or not at all. The camera offset value is the offset from the left side of the billboard. The vertical arm length also controls the support plates around the arm; if greater than 400, the plates are moved and two additional plates are made. The arm angle must be between 0 and 30 degrees.

2: Fascia Box Parameters

The Fascia box has its parameters set here. The checkbox controls whether a Fascia box is included or not. If it is checked, the text box and radio buttons are enabled. The height of the Fascia box must be input in the text box if the Fascia box is enabled. The radio buttons control whether it is a 2D skirt model or 3D box.

3: Ladder and Hatch

The position and section profiles and materials of ladders and hatches are set here. The ladders and hatches are automatically aligned, and the hatch is set on top and middle walkways as default.

4: Add/Edit Lifting Points Tab

These tabs switch between the user adding new lifting point locations or modifying and removing existing ones.

5: Lifting Point Input

Lifting point locations can be input here. The location of a lifting point can be input into the text box, as a distance from the left side of the billboard, and then added to the appropriate list(s) by clicking the 'Add' button. The radio buttons control whether

the lifting point is added to the top, bottom or both. A warning message will appear for invalid input when adding or editing locations.

6: Lifting Point Display

The two boxes show the lists of lifting point locations that have been added. Items in the lists can be selected to modify or remove them.

7: Add/Edit Walkways Tab

These tabs switch between the user adding new mid-walkway locations or modifying and removing existing ones.

8: Walkway Input

Locations of walkways can be input into the text box, given as distances from the bottom of the billboard, and added to the list below by clicking the 'Add' button.

9: Walkway List Display

The box shows the mid-walkway locations that have been added. Items in the list can be selected to modify or remove them. This list does not include walkways automatically generated at the bottom of each box split.

10: Back Bracing

This check box enables the back bracing. Due to its nature that it is unfinished, the user is expected to work on manual changes if the back bracing is enabled.

11: Cladding Input Parameters

The cladding has its parameters set here. Cladding parameters can be set for all faces at once, or for each face individually, chosen from a dropdown list. Selecting 'All' will overwrite settings for individual faces. Switching between faces will update the

displayed parameters to their current values for that face. The type of cladding can be selected from a dropdown list. Depending on the cladding type selected, different parameters will be able to be set.

12: Cladding Value Display

The dimensions of the selected cladding are displayed here. They vary depending on the type of cladding and specified cladding parameters.

13: Gal-Hole Parameter Input

The parameters for gal-hole size and position can be set here. The radio buttons control whether the hole size will be set automatically or taken from user input, while the offsets are always taken as user input. The offsets change back to the industry standard values of 10 and 2mm when the program launches. If set to 'Auto', gal-hole size is based on an internal dictionary containing appropriate values for different beam profiles. These values are based on the 2-holes columns in Table 1, shown on the next page.

14: Flashing Options

Options for flashings can be set here. The checkbox controls whether flashings will be added or not. If checked, the colour and thickness of flashings can be set, and the radio buttons can be used to choose whether the flashing dimensions will be set automatically or taken from user input.

15: Top/Bottom/Side Flashing Tab

These tabs switch between setting the dimensions of the top, bottom and side flashings. The text boxes will be populated with automatically calculated values if the 'Auto' radio is checked immediately after switching to 'Manual'. Depending on which tab is selected, the diagram and associated input text boxes below will change.

16: Flashing Parameter Input

The dimensions of different parts of the flashings can be set here. Values can be input in text boxes that correspond to measurements on the diagram displayed. The top, bottom and both side flashings each have their dimensions set separately.

17: Rear Door Inputs

This section is the inputs for the rear door, which contain its position, dimension, and the section profiles and materials. If the position of the rear door overlaps other structure components, a warning message would appear.