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Instruction on 4D planning

using Autodesk Navisworks Simulate

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1 Introduction

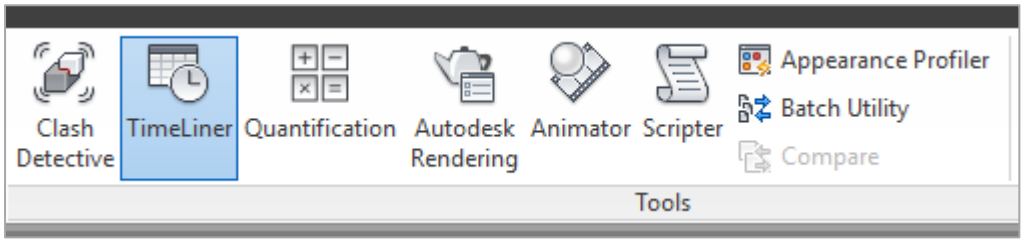
This handout is a brief instruction on how to setup a 4D planning for a construction project by using Autodesk Navisworks Simulate (Navisworks Freedom does not support the TimeLiner function). A 4D planning is a 3D model represented in time. This document presents a workflow on how to link the planning to a 3D model.

2 Task types

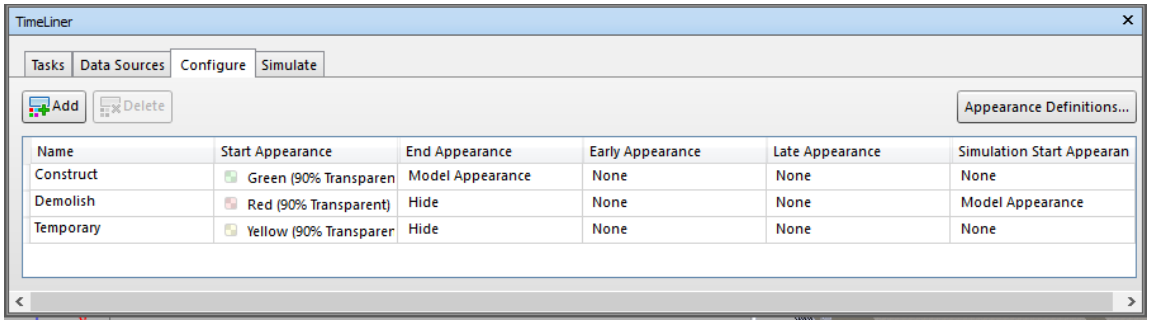
Task types in Navisworks define how an object or activity is represented in the model during the simulation of the planning. Examples of an activity are ‘Demolish, Construct or Temporary’.

2.1 Adding and editing task types

Go to the *TimeLiner* in the Home tab.

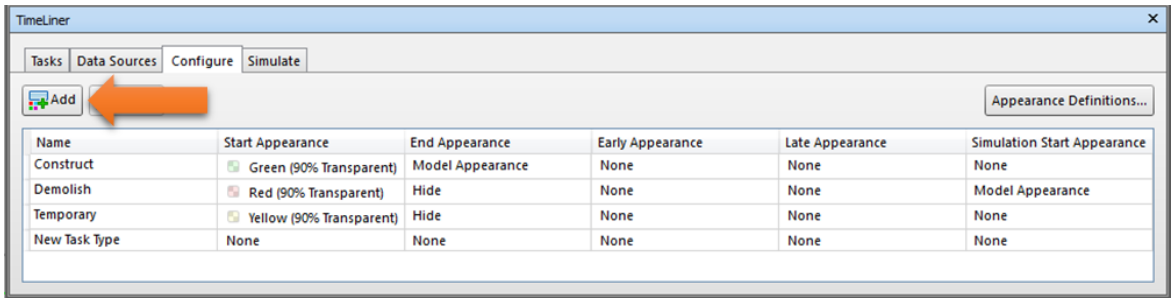


The *TimeLiner* will open. There are four tabs within the *TimeLiner*: Tasks, Data Sources, Configure and Simulate. To add, edit or delete Task types you browse to the tab *Configure*. Three task types are already defined.



A short explanation of the properties:

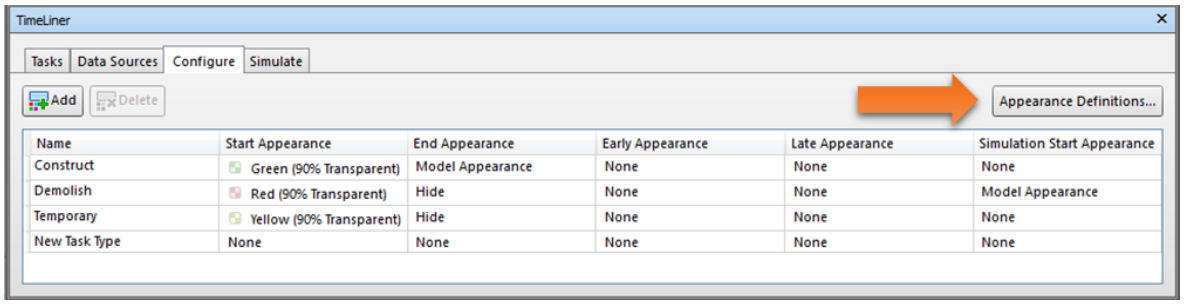
1. Start Appearance - how the items will look at the start of the task, for example Transparent Green.
2. End Appearance - how the items will look when the task is completed, for example Hidden.
3. Early Appearance - how the items will look if the task is started before the planned time, for example Transparent Yellow.
4. Late Appearance - how the items will look if the task is started after the planned time, for example Transparent Red.
5. Simulation Start Appearance - how the items should be displayed at the start of a simulation.

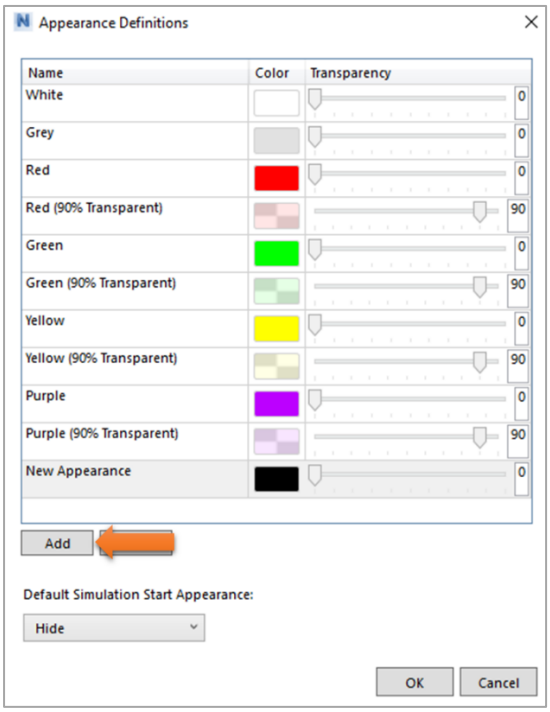


To add a task type click on *Add*. The new task type will appear underneath the already existing task types. Double click on the name of the new task type to edit this. Configure the desired properties *Start-*, *End* and if necessary the *Simulation Start Appearance.*

2.2 Edit Appearance of Task types

Click on *Appearance Definitions* to see the different appearances and to edit them.





1. Click on Add to add a new colour style
2. Double click on the name to change it
3. Double click on the colour to change it
4. Change the transparency by using the slider or by giving a number between 0 and 100.

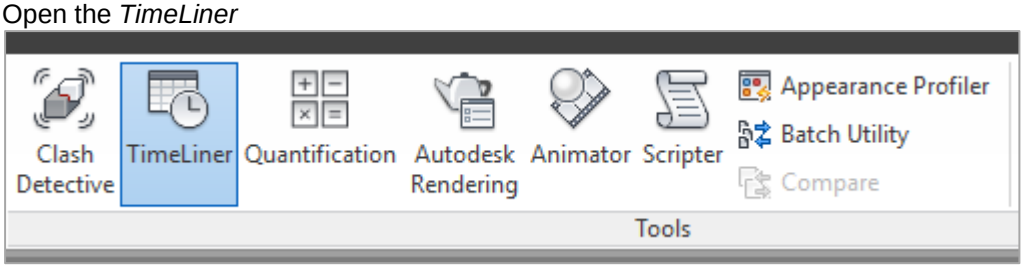
3 CSV-import

In this instruction a CSV-file is the data source for the planning. Make sure that the CSV is compatible for importing within Navisworks. There are no comma's aloud in this file.

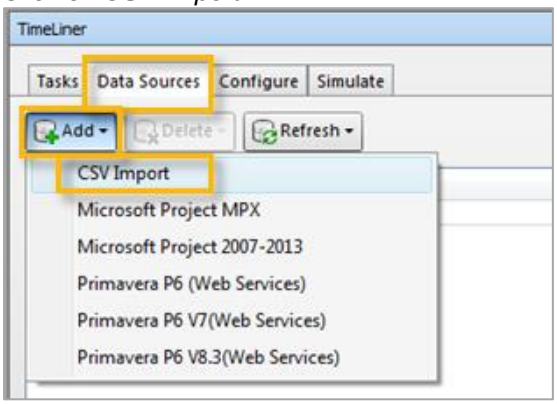
Your planning must contain the following attributes to generate the link between your data source and 3D objects:

- Activity ID
- Activity Name
- Task types
- Planned Start Date (Start)
- Planned End Date (Finish)
- **Encoding**: make sure the objects in your model are encoded with a unique code that represents these object. It is recommended to use a SBS-code: System Breakdown Structure. This SBS-code needs to be integrated in your 3D objects originating from your designer software (e.g. Revit, Civil3D).

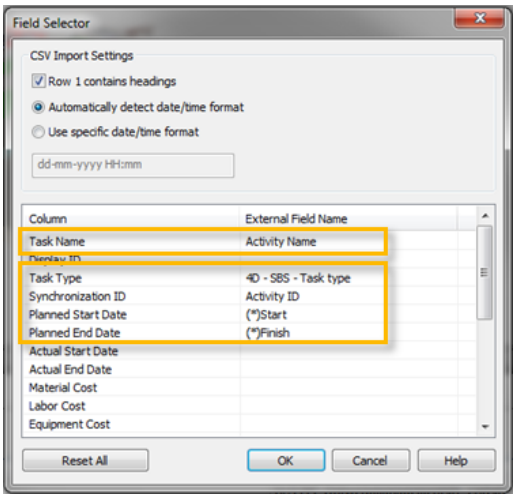
1. Open the *TimeLiner*



2. Click on the tab *Data Sources*
3. Click on *Add*
4. Click on *CSV Import*



5. Select the CSV-file you want to import and click on *Open*
6. Link the columns from your CSV-file to the columns in Navisworks

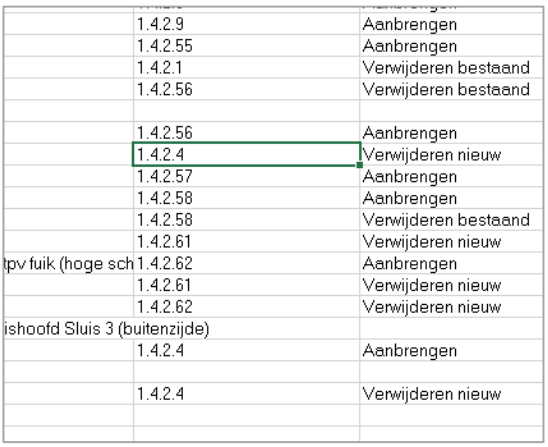


7. Link the encoding (SBS) of your objects to the column ‘User1’ (scroll down the list of columns to see this one).
8. After linking the columns of your CSV-file to the Navisworks columns, click on *OK*.

9. Import the planning by right clicking on your new data source.
10. Click on *Rebuild Task Hierarchy.* The planning originating from the CSV-file is now linked to your NWF in Navisworks.
11. To update your planning, use *Synchronize*. The update will only work for existing activities in your planning, so it is useful for updates in time. If the planning has changed due to new or deleted activities, the option *Synchronize* will not work. You need to repeat the steps above to import your planning.

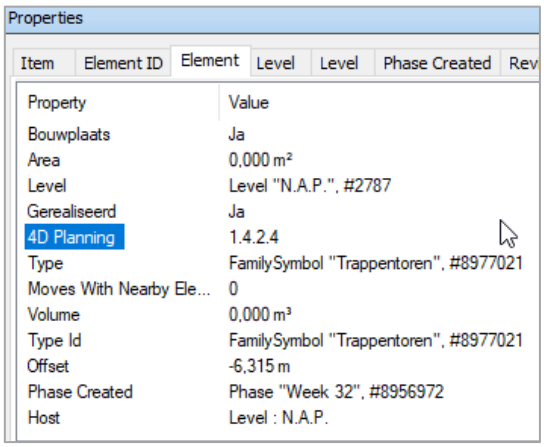
4 Attach objects to activities

To attach the objects in your 3D model to the activities from the planning, we now use the predefined rule *Attach Items to Task by Category/Property* based on an encoding-property. There are other ways to link your objects to planning activities (*Items By Task Name, Search Sets* or *Layers By Task Name*).



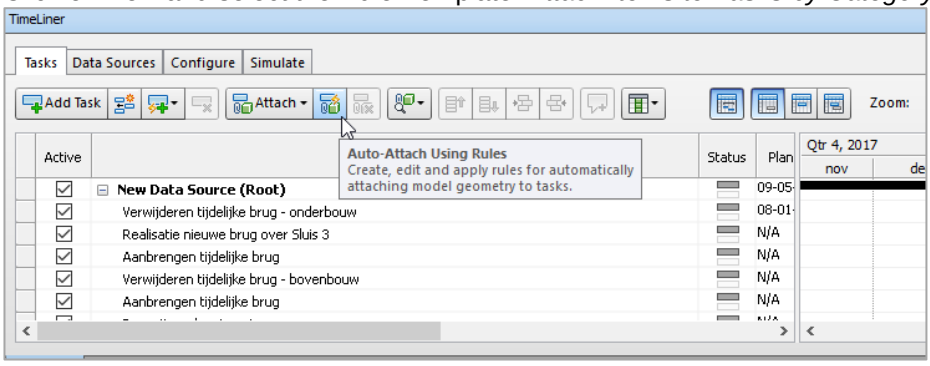
	1.4.2.9	Aanbrengen
	1.4.2.55	Aanbrengen
	1.4.2.1	Verwijderen bestaand
	1.4.2.56	Verwijderen bestaand
	1.4.2.56	Aanbrengen
	1.4.2.4	Verwijderen nieuw
	1.4.2.57	Aanbrengen
	1.4.2.58	Aanbrengen
	1.4.2.58	Verwijderen bestaand
	1.4.2.61	Verwijderen nieuw
tpv fuik (hoge sch	1.4.2.62	Aanbrengen
	1.4.2.61	Verwijderen nieuw
	1.4.2.62	Verwijderen nieuw
ishoofd Sluis 3 (buitenzijde)		
	1.4.2.4	Aanbrengen
	1.4.2.4	Verwijderen nieuw

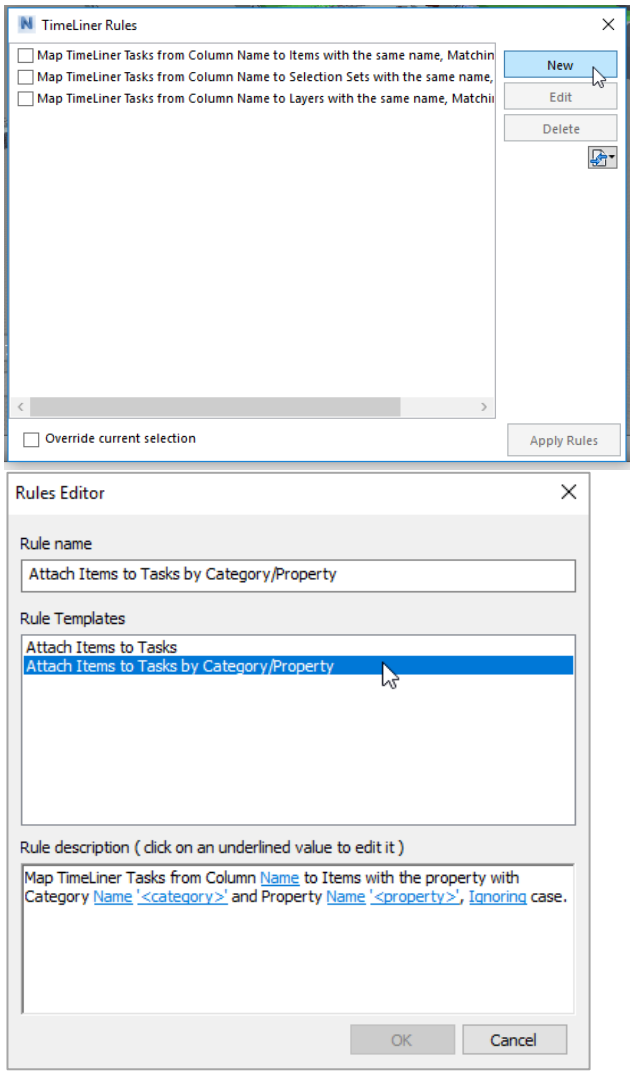
Planning with activities and task types



Properties of 3D object

1. Open the TimeLiner and browse to the tab Tasks
2. Click on *Auto-Attach Using Rules*
3. Click on New and select the Rule Template: *Attach Items to Tasks by Category/Property*

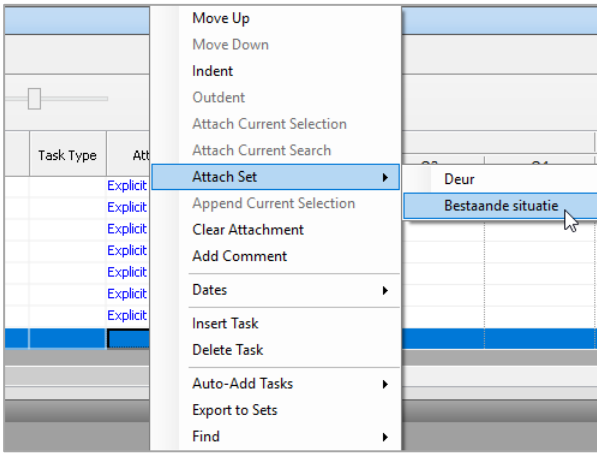


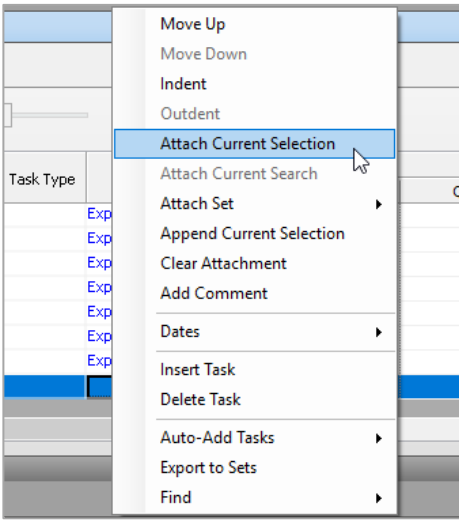


4. Click on *Column* in the Rule Description and select the column where the encoding is stored (User 1).
5. For <*category*> select the category or tab in which the encoding is stored. In the example above, you can see that the 4D code (1.4.2.4) is stored in the tab Element.
6. For <*property*> select the matching property where the codes are stored. In this example it is the property 4D Planning.
7. Click on OK and select the newly made rule.
8. Click on *Apply Rules*. It might take a while if there are a lot of objects.
9. Close the TimeLiner screen.
10. If the link was successful, you will see attached objects in the column ‘Attachted’.

Name	Status	Planned Start	Planned End	Actual Start	Actual End	Task Type	Attached	Total Cost
ruimte Sluis 3 binnenzijde oost		08-09-2017	N/A	N/A	N/A			
moot 2 t/m 10 tot +1.00 NAP		N/A	08-04-2017	N/A	N/A		Explicit S...	
anden tot +3.00 NAP		08-07-2017	N/A	N/A	N/A			
in kolk tot +0.00 NAP		04-04-2018	04-11-2018	N/A	N/A			
stand binnenhoofd met kolk		07-03-2018	07-04-2018	N/A	N/A			
dijk oost		N/A	08-04-2017	N/A	N/A		Explicit S...	
vullen tot +4.50 NAP		N/A	N/A	N/A	N/A		Explicit S...	
idewanden		08-07-2017	N/A	N/A	N/A			
kplateau buitenhoofd (30x30m)		N/A	N/A	N/A	N/A		Explicit S...	
sluiting op Lekdijk Oost		N/A	08-04-2017	N/A	N/A		Explicit S...	
it werkweg		N/A	08-04-2017	N/A	N/A		Explicit S...	
sluiting op tijdelijk fietsbrug		07-03-2017	07-07-2017	N/A	N/A		Explicit S...	
kolk tbv sloop diepwanden		N/A	08-11-2017	N/A	N/A		Explicit S...	
errein op + 400 NAP t.b.v. realisatie diepwand Sluiskolk Sluis 3		N/A	N/A	N/A	N/A			
niet mengcentrale		N/A	05-02-2017	N/A	N/A			
ntoniet mengcentrale		08-01-2017	N/A	N/A	N/A			
and 4 + Vak C		N/A	02-10-2017	N/A	N/A			

11. It is also possible to add Tasks manually by clicking on *Add Task*. The task will appear on the bottom of the lists of tasks.
12. Right click on the new tasks and click *Move up* to set it on top of your list.
13. Configure the columns *Planned Start, Planned End* and choose a Task type.
14. If you want to attach a current selection of objects to your new tasks, right click in the column 'Attached' and choose *Attach Current Selection*. You can also use a selection set (*Attach Set*).

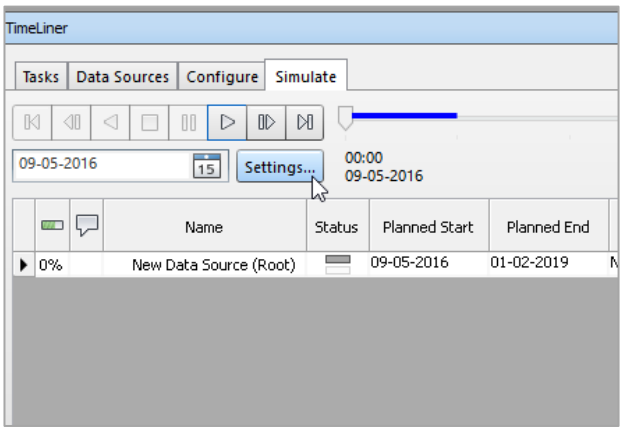


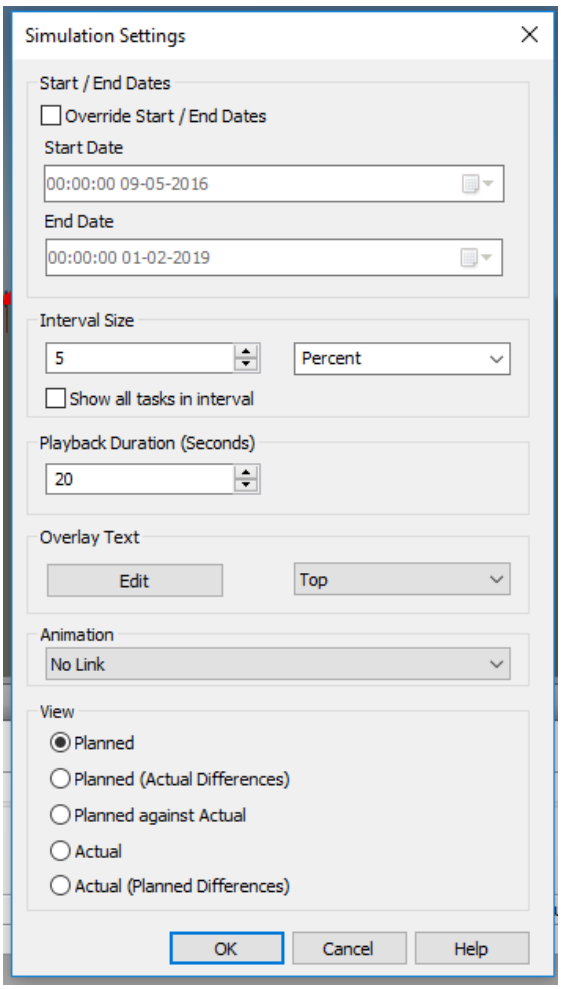


5 Simulate planning

Simulate your planning by exporting a simulation.

1. Open the *TimeLiner*
2. Click on the tab *Simulate* and click *Settings*…



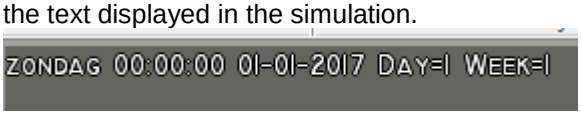


Override Start / End Dates: adjust your start- and end date if you want a specific timeframe.

Interval Size: you can define the Interval Size to use when stepping through the simulation using the playback controls.

Playback Duration (Seconds): the time of your total simulation (start to finish).

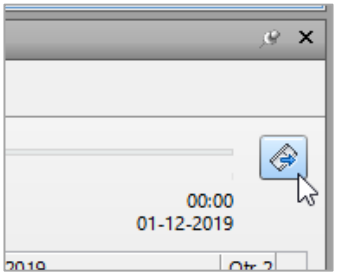
Overlay Text: adjust the content and design of the text displayed in the simulation.

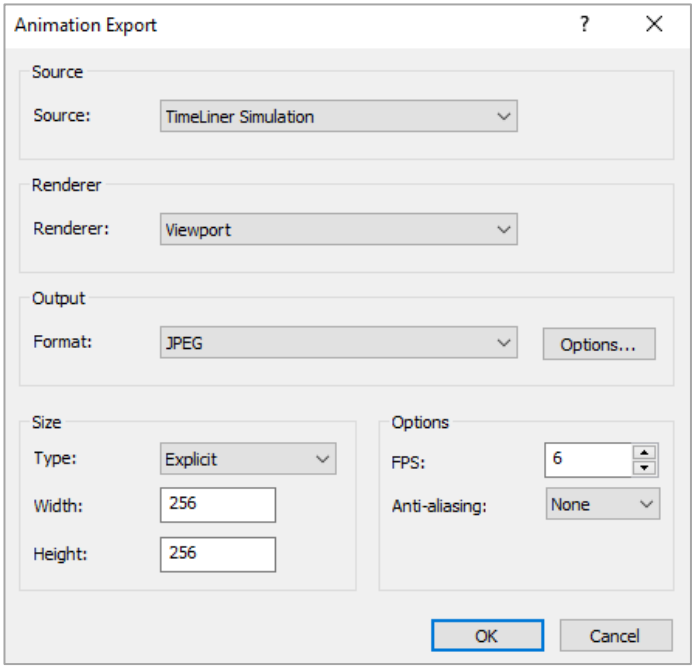


Animation: you can add animation to an entire schedule, so that during the TimeLiner sequence playback, Autodesk Navisworks will also play the specified viewpoint animation or camera.

View: this gives you the possibility to display your planning in different ways, as planned or with the actual start or differences.

3. If you have configured the settings, export your simulation by clicking on the icon *Export Animation* on the right of the timeline. Choose the settings for your export.



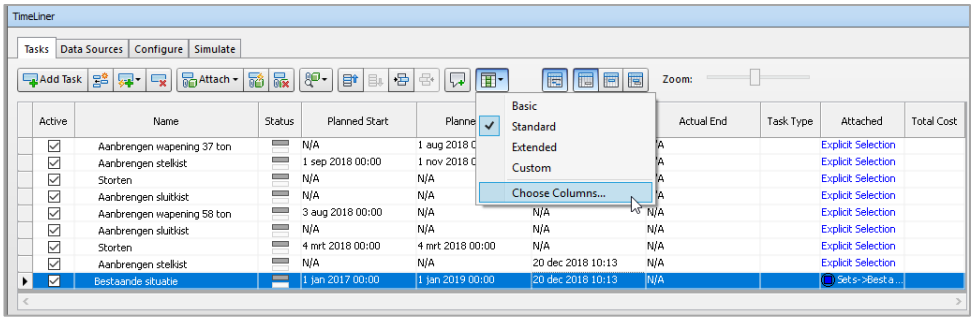


6 Integrate an animation

Within the TimeLiner, you can attach an animation in the planning. Use this for important activities during the construction that need to be visible, such as the placement of a lock gate, bridge or activities underground.

This instruction will not go into detail on how to generate an Animation. Detailed information on how to generate an Animation, go to this link within the Autodesk Knowledge Network.

1. To start, click on the TimeLiner and browse to the tab Tasks.
2. Click on *Columns* and then *Choose Columns*.



3. Check the box next to *Animation*.
4. You will see that the column Animation appears in your screen.
5. Select the task for which you want to attach an animation and click in the column Animation. Choose the animation.