Vehicle Tracking
Fully Understand What Is Possible

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Autodesk

Class summary

Class will cover Vehicle library and we will create new articulated vehicles based on given data sheets, including rear-axle steering. We will add load to the trailer for analysis purposes and as well as for animation. You will also see how to import vehicle created in Autodesk 3dsMax to have rich vehicle library for animation. We will cover repotring, an important part of the product. We will also discuss roundabout design possibilities

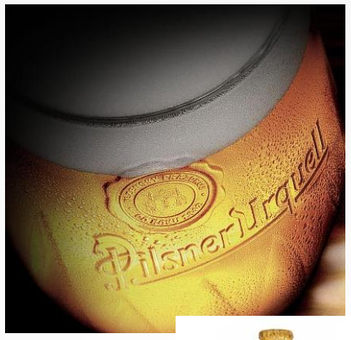
Key learning objectives

At the end of this class, you will be able to:

- Create a new vehicle based on a data sheet
- Analyze and report swept path with different load
- Animate a vehicle with a 3D load
- Create roundabout

Introduction

Where I am from?



What I do?

Poland:
1 country,
1 language
Popul.: 40 million

CHS:
13 Countries (7 EU),
11 languages
Popul.: 81 million

Theory

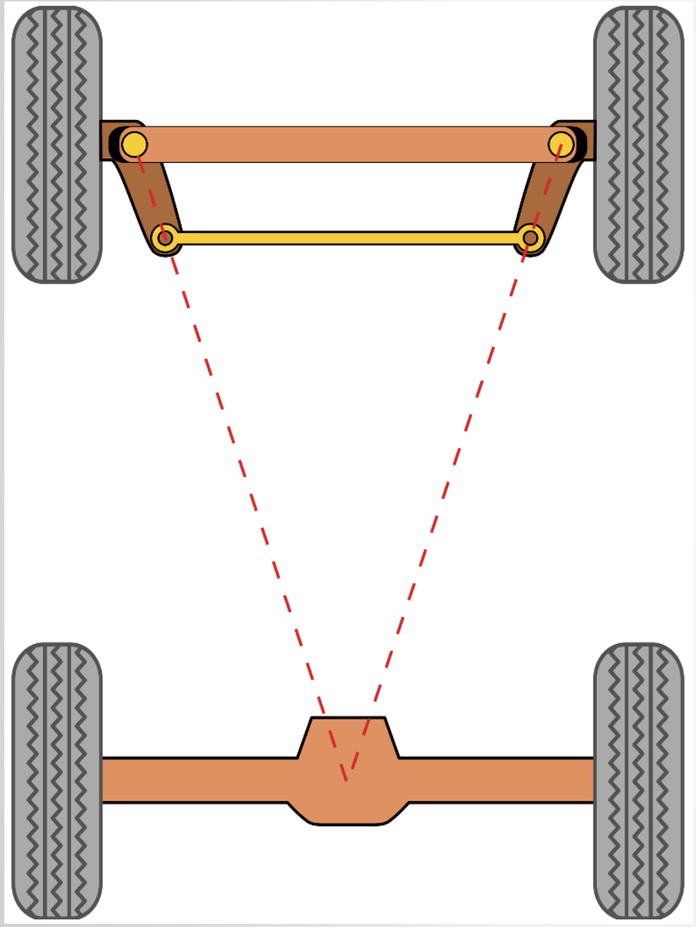
Basic Theory Behind Vehicle Tracking

1. The Ackerman principle:

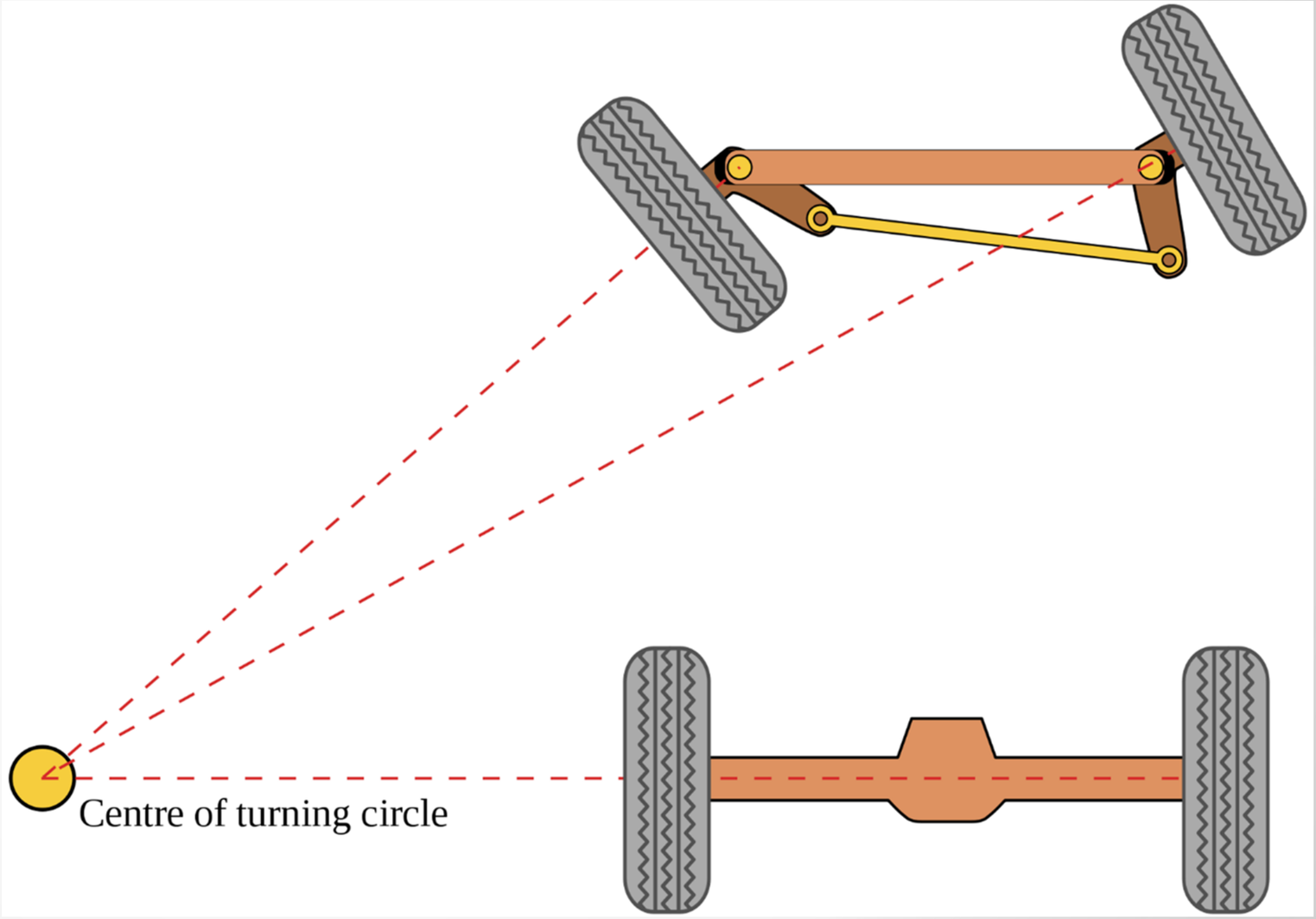
Ackermann steering geometry is a geometric arrangement of linkages in the steering of a car or other vehicle designed to solve the problem of wheels on the inside and outside of a turn needing to trace out circles of different radius. It was invented by the German carriage builder Georg Lankensperger in Munich in 1817, then patented by his agent in England, Rudolph Ackermann (1764–1834) in 1818 for horse-drawn carriages. Erasmus Darwin may have a prior claim as the inventor dating from 1758.

Source: Wikipedia

Basic Theory Behind Vehicle Tracking



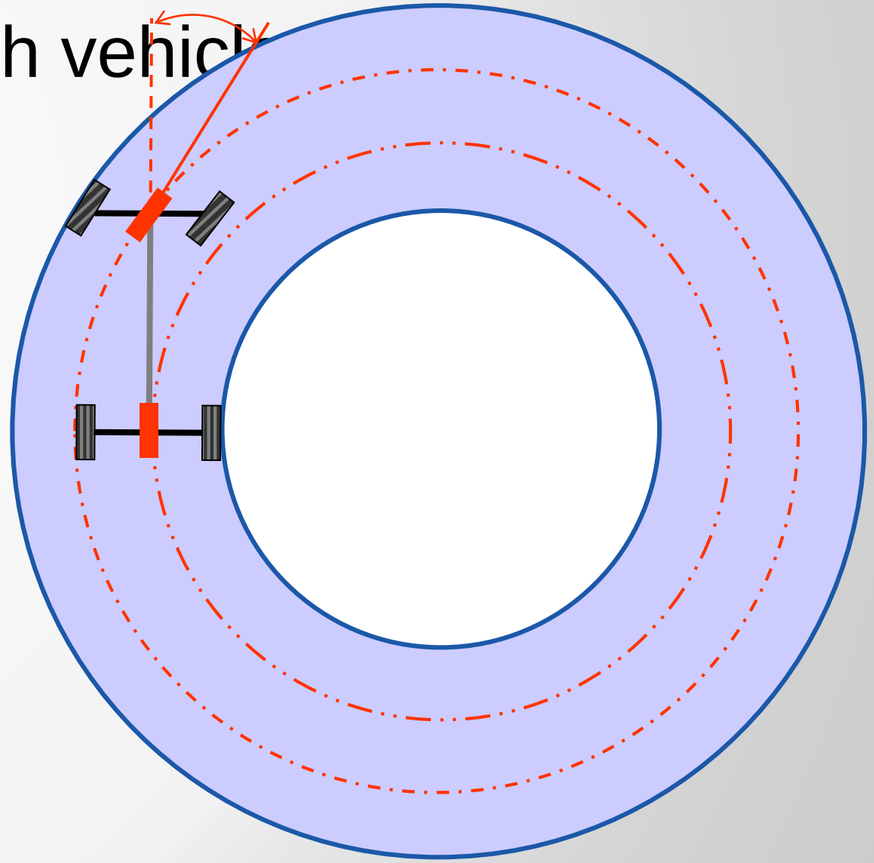
Images credit: Wikipedia



Basic Theory Behind Vehicle Tracking

2. “Spine” vehicles:

- Imagine a plan bicycle that represents each vehicle
  - A single effective steering angle
  - A single effective front axle
  - A single effective rear axle
- For multiple units the concept is the same



Basic Theory Behind Vehicle Tracking

3. The boring stuff…

…tells us that:

$$R = \sqrt{L^2 + \left(\frac{L}{\tan\theta} + \frac{T}{2}\right)^2}$$

- Wheelbase
- Maximum Steering Angle
- Minimum Turning Radius

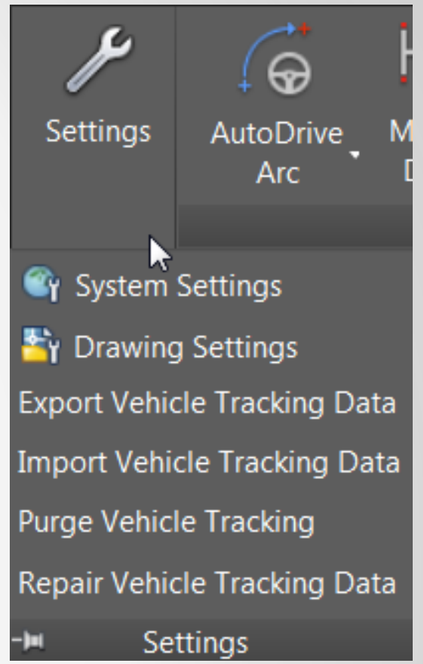
θ = max steer angle of equivalent central wheel
R = min turning circle radius to outer wheel
L = effective wheel base
T = wheel track

Applicable to zero thickness tyres

are the three major variables related to a vehicle's turning capabilities

AVT Unique Settings

- System Settings
  - Control global AVT settings for each installation
- Drawing Settings
  - Control AVT settings for the current drawing
- *Existing objects are not affected unless selected*

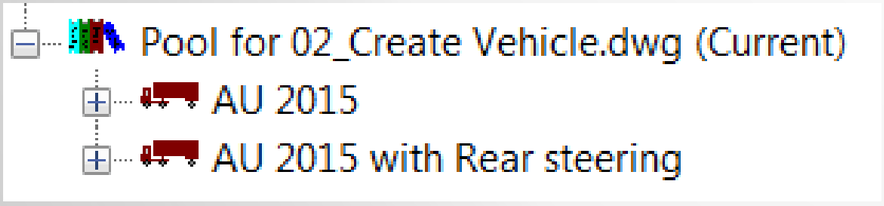


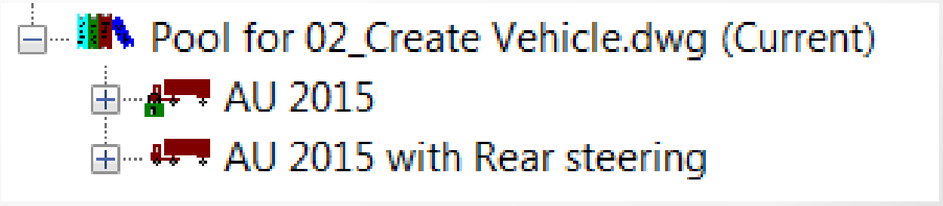
Vehicle Library

Vehicle Libraries

- Library
  - Group
    - Vehicle
      - Separate Vehicle Units

- A “Pool” is created for each open DWG and all vehicles used are stored in the pool (within the DWG)

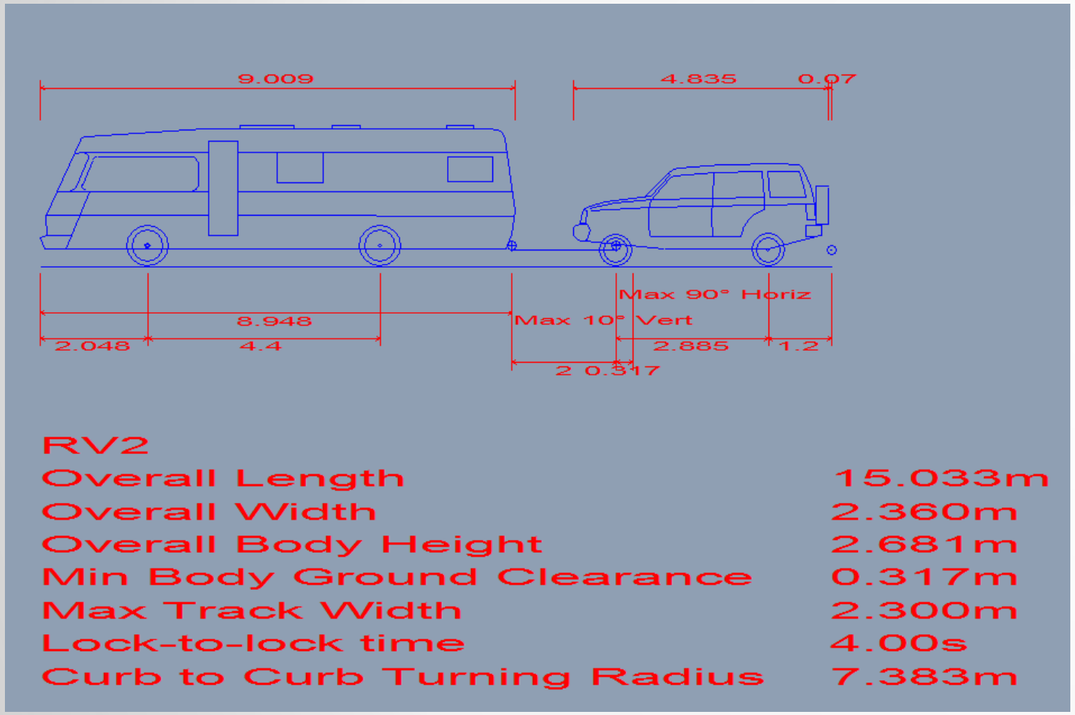




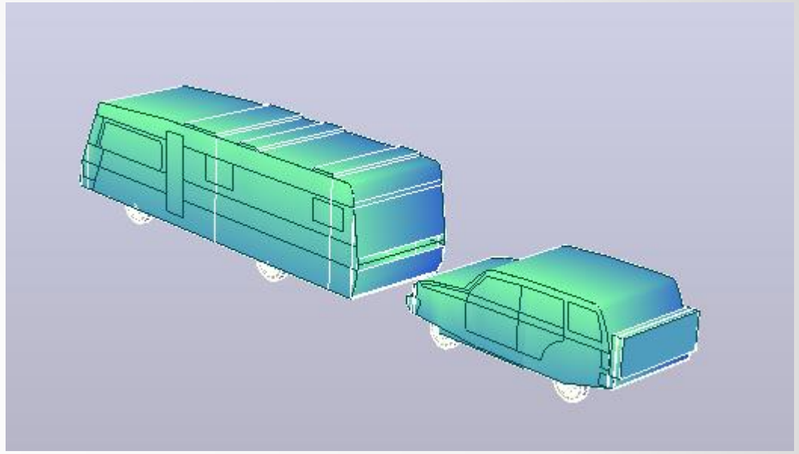
Demonstration Topics

- Combining units (RV with 4WD)
- Creating vehicle based on Datasheet
- Rear Steering

Combining units

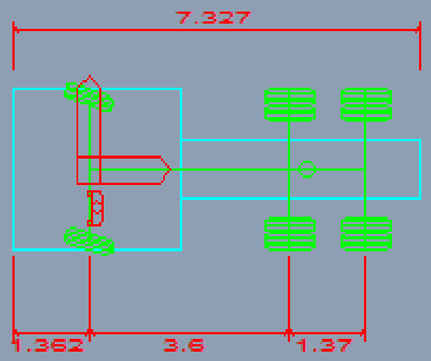


RV2	
Overall Length	15.033m
Overall Width	2.360m
Overall Body Height	2.681m
Min Body Ground Clearance	0.317m
Max Track Width	2.300m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	7.383m

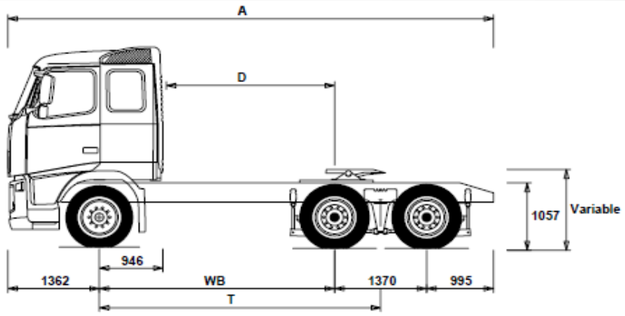


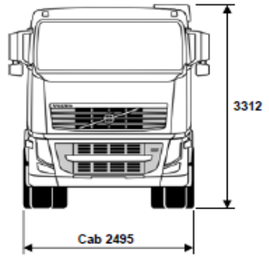
Create vehicle based on Datasheet

- Unit 1 – Tractor



AU 2015	
Overall Length	7.327m
Overall Width	2.495m
Overall Body Height	3.407m
Min Body Ground Clearance	0.331m
Track Width	2.495m
Lock-to-lock time	6.00s
Wall to Wall Turning Radius	8.300m





Chassis Dimensions [mm]

WB	Wheelbase	3000	3200	3600
A	Overall Chassis Length	6727	6927	7327
D	Centre of rear axle to back of cab	2004	2204	2604
T	Theoretical Wheelbase	3685	3885	4285

Chassis Weights [kg]

Front Axle	5040	5055	5080
Rear Bogie	3915	3940	3965
Kerb Weight	8955	8995	9045

Turning Diameter [mm]

Turning Circle Diameter Kerb to Kerb	13000	13600	14900
Turning Circle Diameter Wall to Wall	14700	15300	16600

Plated Weights [kg]	Plated	Design
Gross Vehicle Weight	26000	29000
Gross Combination Weight	44000	44000
Front Axle	7100	8000
Rear Bogie	19000	21000

Create vehicle based on Datasheet

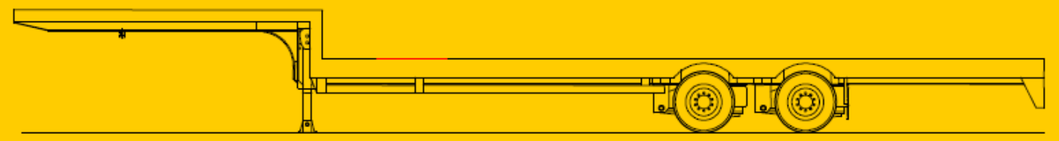
- Unit 2 – Trailer

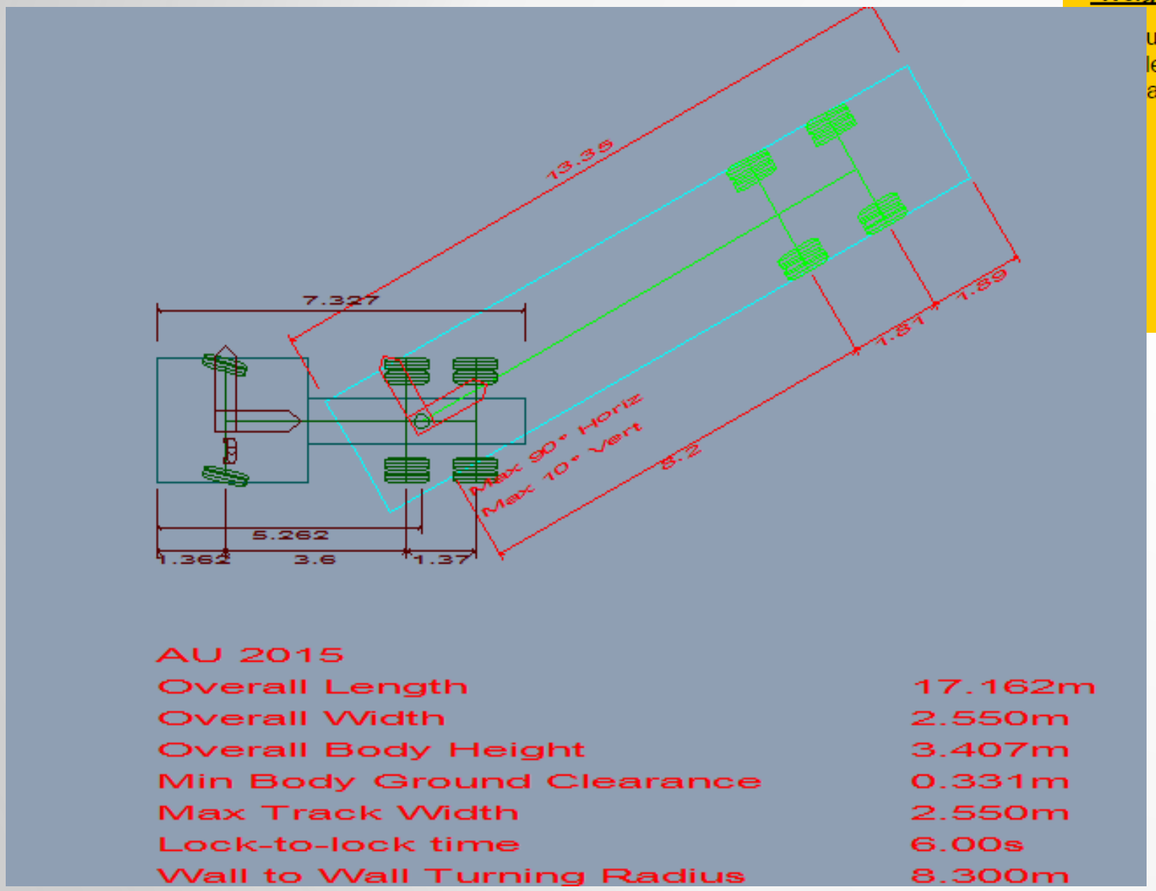
***Dimensions:**

total length	: 13.350 mm	coupling height	: 1.180 mm
front overhang	: 1.400 mm	height of lowbed	: 900 mm
wheelbase ca.	: 8.200 mm	axle distance	: 1.810 mm
rear overhang ca.	: 3.750 mm	Head stir radius (chamfered)	: 1.638 mm
length deepbed	: 9.250 mm	stir radius (truck)	: 2.300 mm
coupling till deepbed	: 2.700 mm	total width	: 2.550 mm

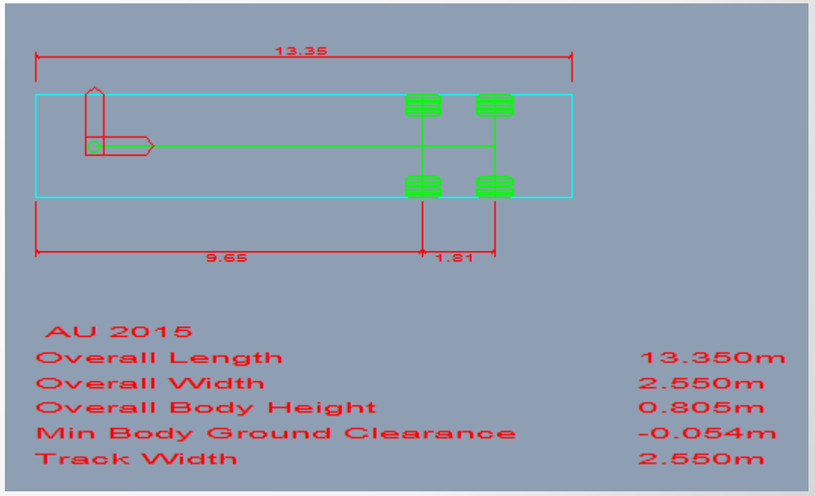
***Weights (technical):**

upling	: 18.000 kg	own weight ca. (excl. options)	: 7.800 kg
les	: 20.000 kg	loading capacity	: 30.200 kg
al weight	: 38.000 kg		





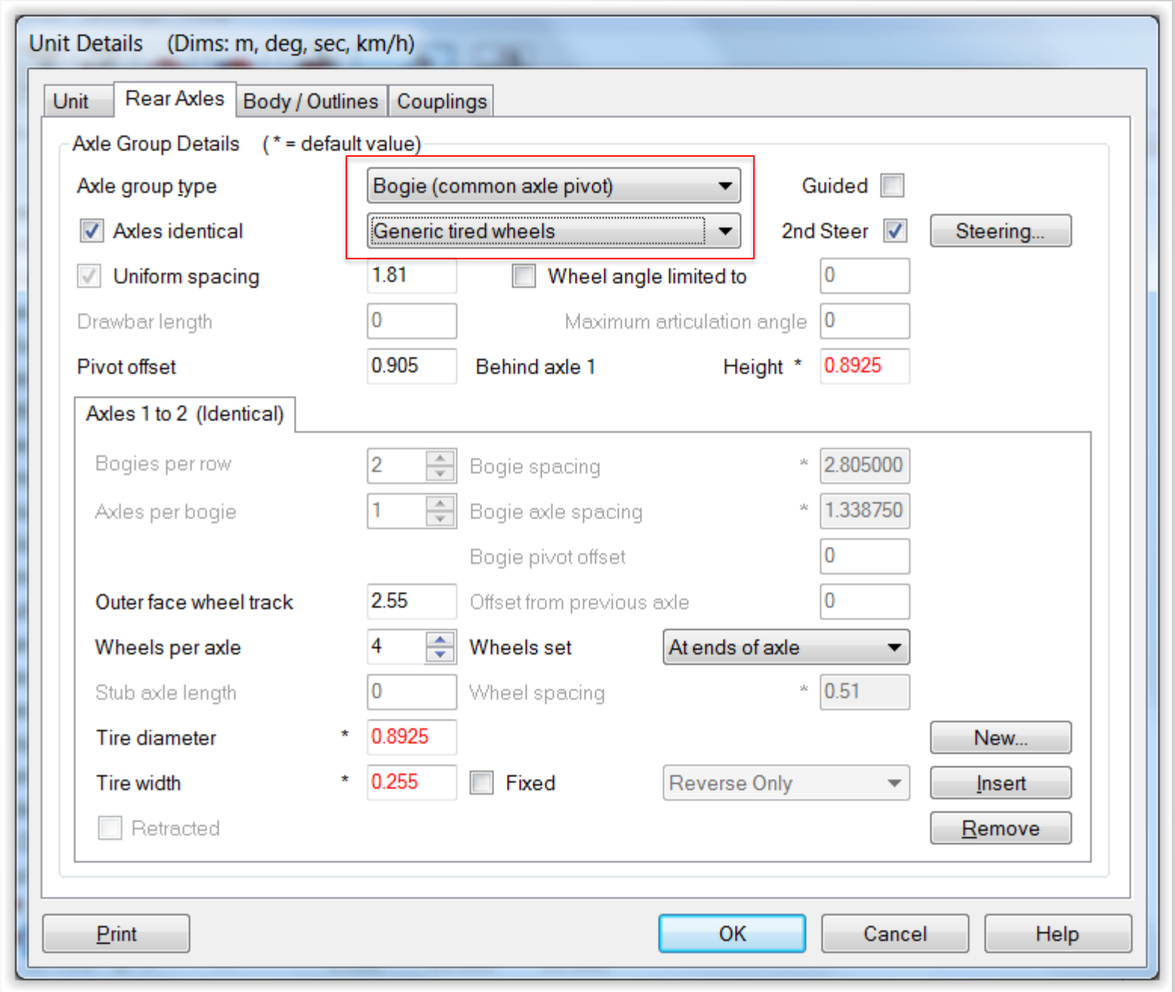
AU 2015	
Overall Length	17.162m
Overall Width	2.550m
Overall Body Height	3.407m
Min Body Ground Clearance	0.331m
Max Track Width	2.550m
Lock-to-lock time	6.00s
Wall to Wall Turning Radius	8.300m



AU 2015	
Overall Length	13.350m
Overall Width	2.550m
Overall Body Height	0.805m
Min Body Ground Clearance	-0.054m
Track Width	2.550m

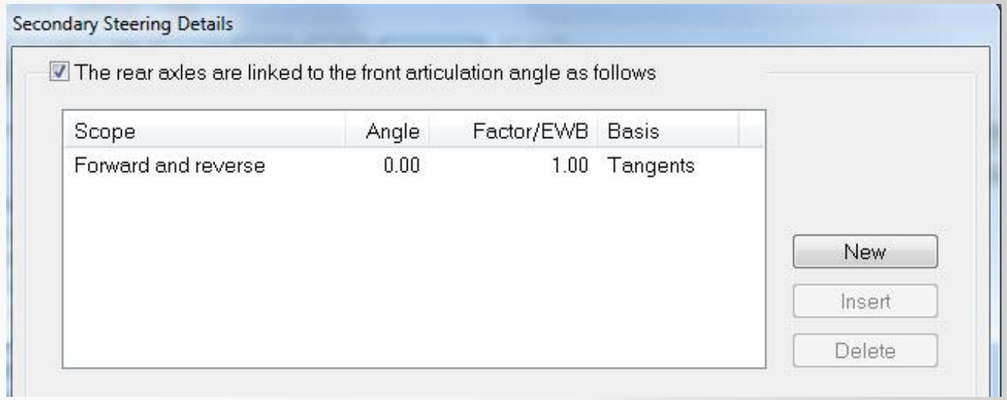
Rear Axles Steering

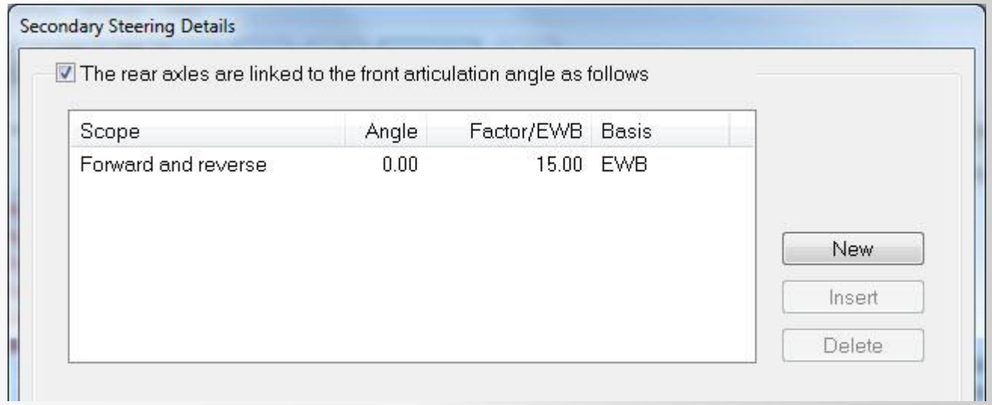
- There are a number of options available in the Advanced Editor for setting up the vehicle axles
- By default the axles will be fixed. Ackerman or Tandem Bogies tend to be the most commonly used. Bogies are also used
- The Steering button is where the properties of the 2nd steered axles can be defined



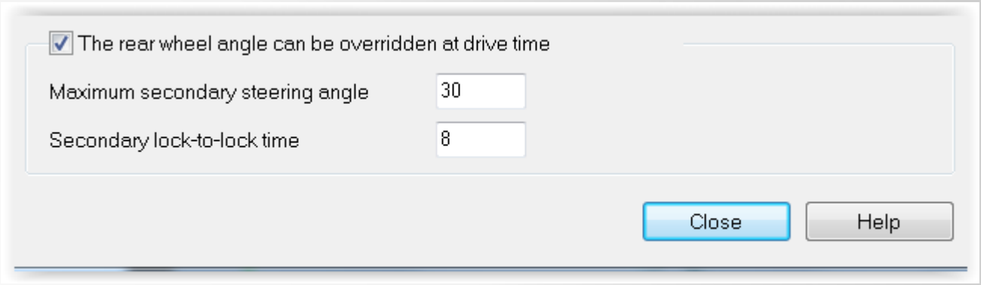
Rear Axles Steering

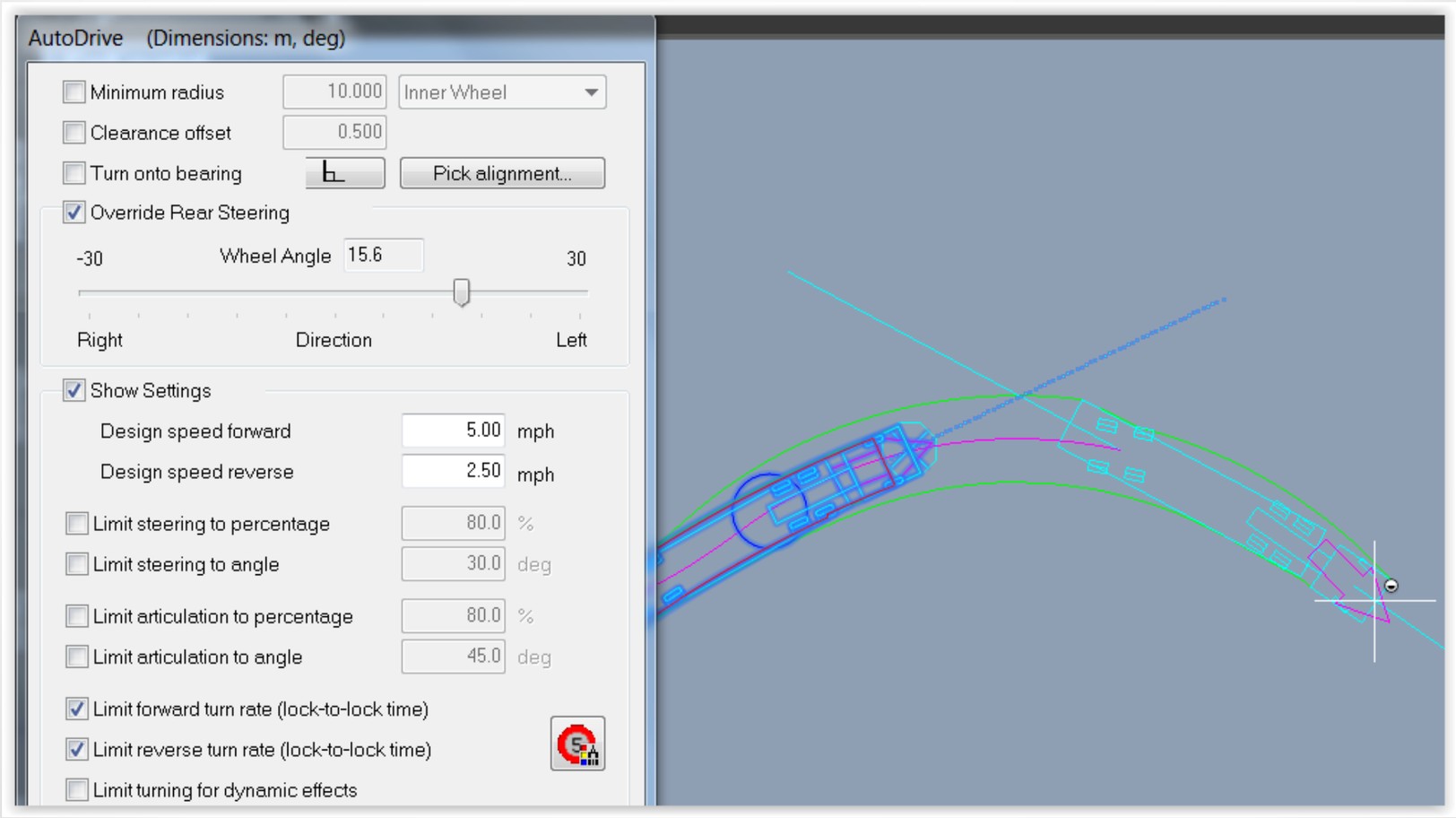
- Steering linkage is used as a fixed value to define how the rear axles turn
  - A factor of 1 (Basis=Angles) means the rearmost axle turns 1degree for every angle of articulation
  - Therefore the cut-in point is midway between the Theoretical Rear Axle and the kingpin/coupling point
  - EWB allows you to hard code the cut in point using distance from kingpin/coupling point



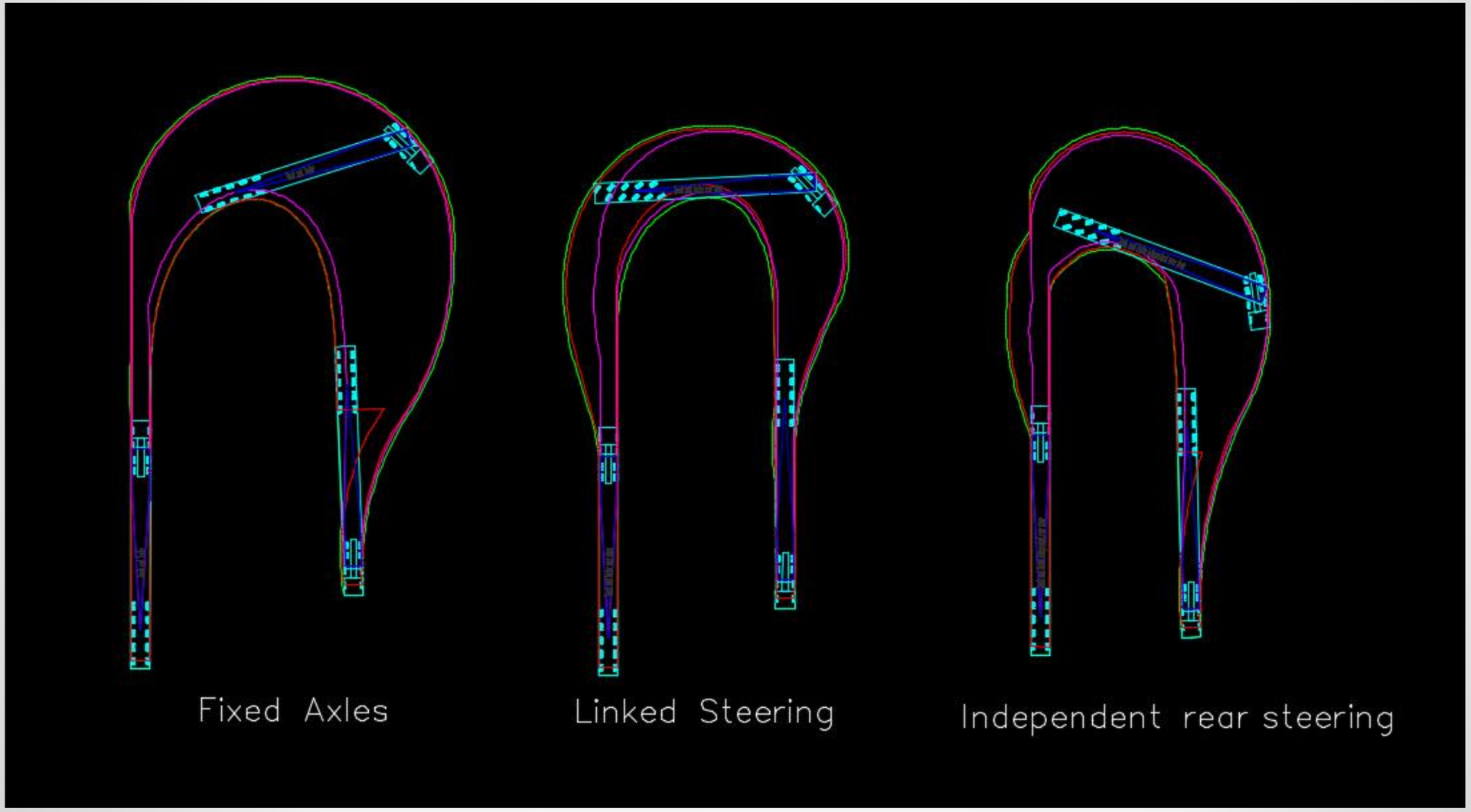


Rear Axles Steering - Override





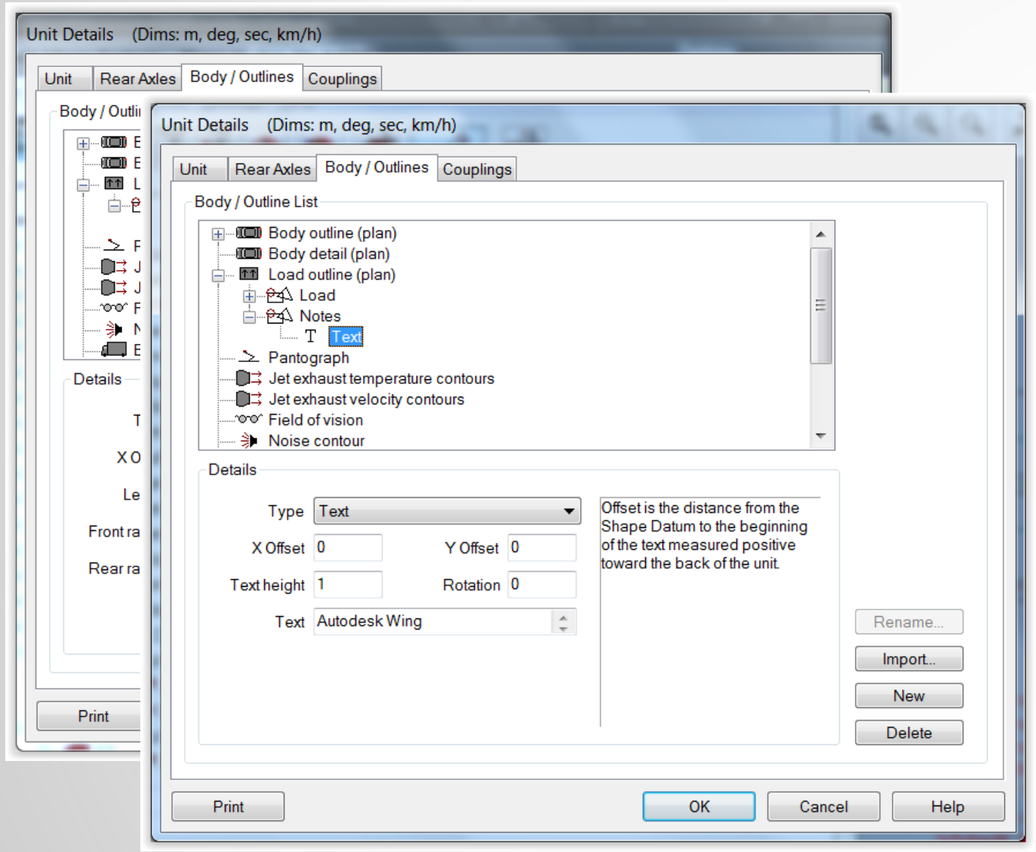
Rear Steering comparison

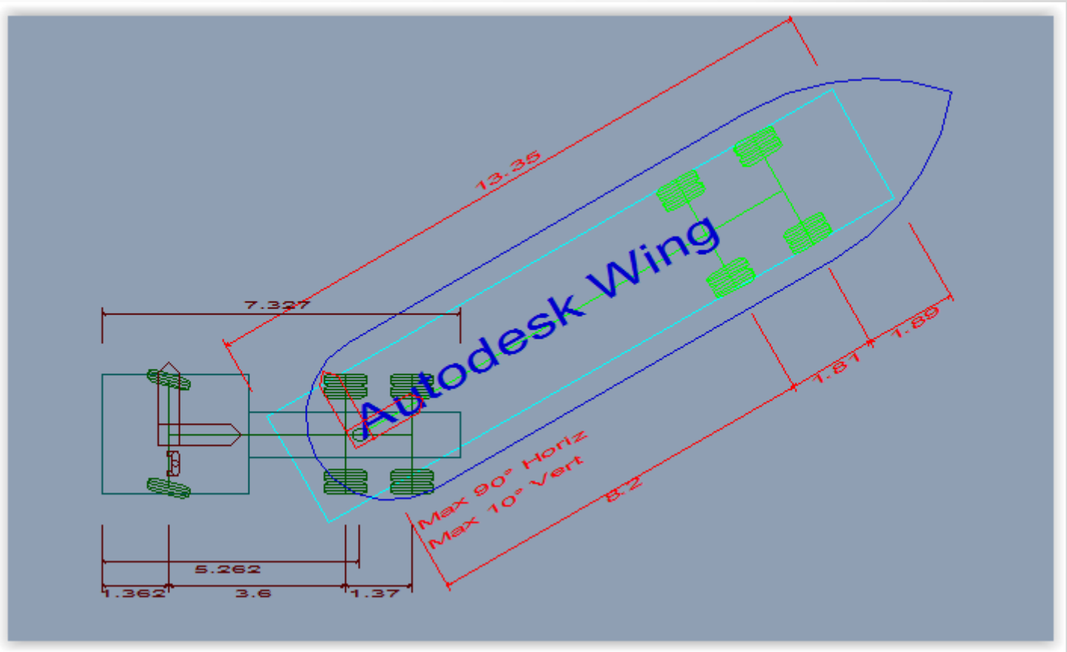


Analysis

User defined Body Outline (Load)

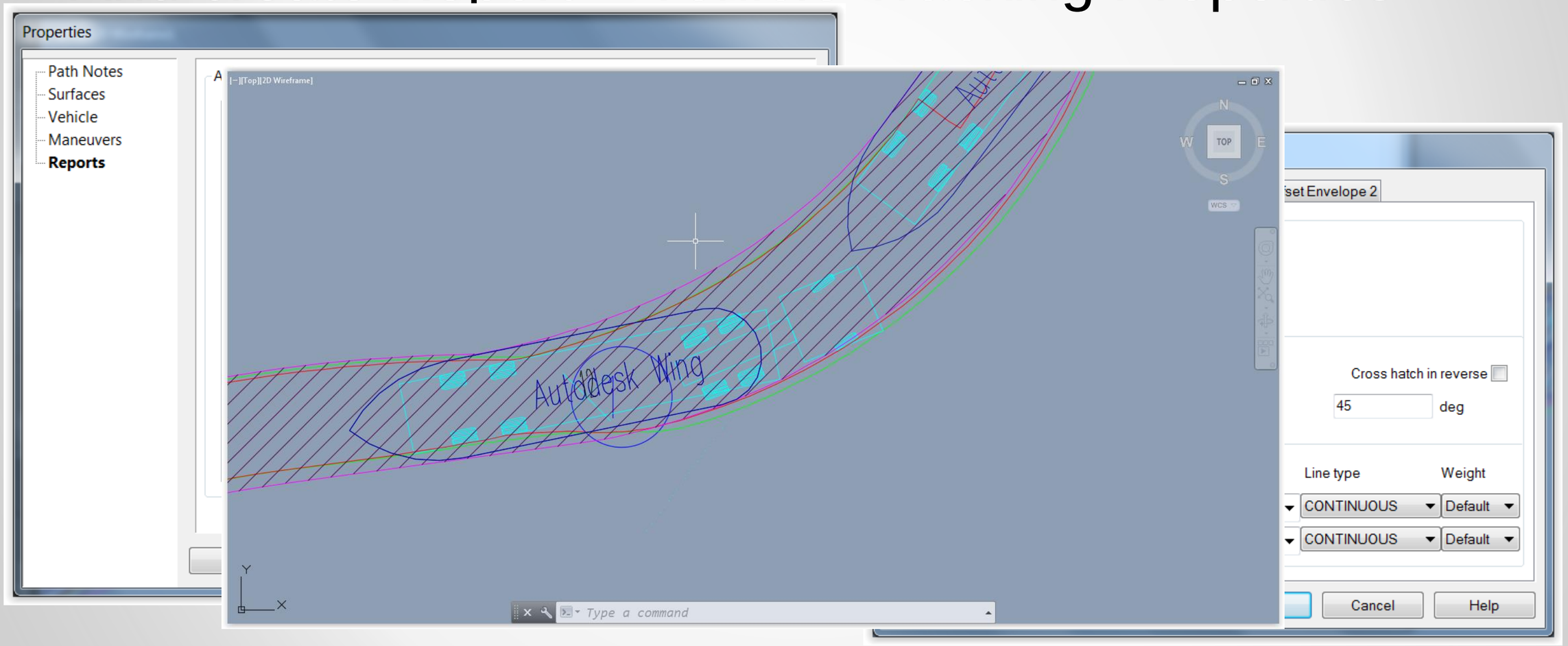
- Possibility to define Load





Analysis

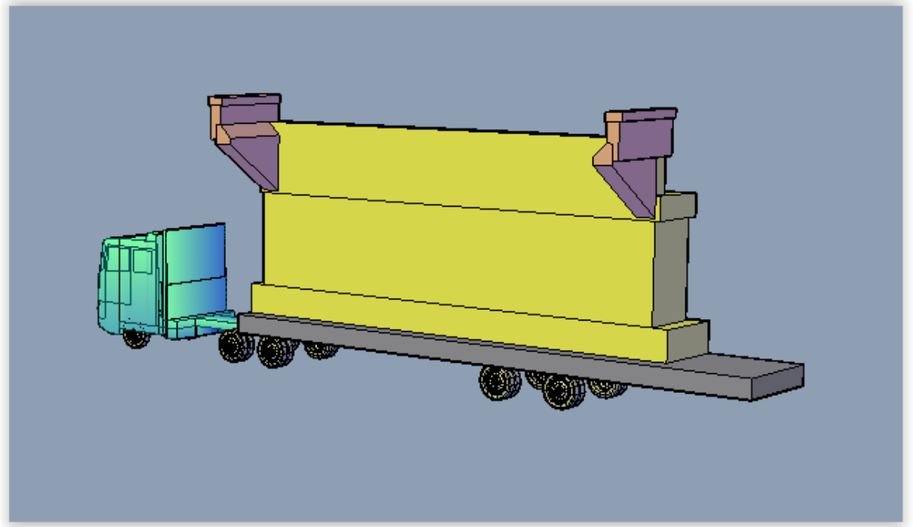
- And create Report – Vehicle Tracking Properties



Animation

User defined Vehicle Body Outline

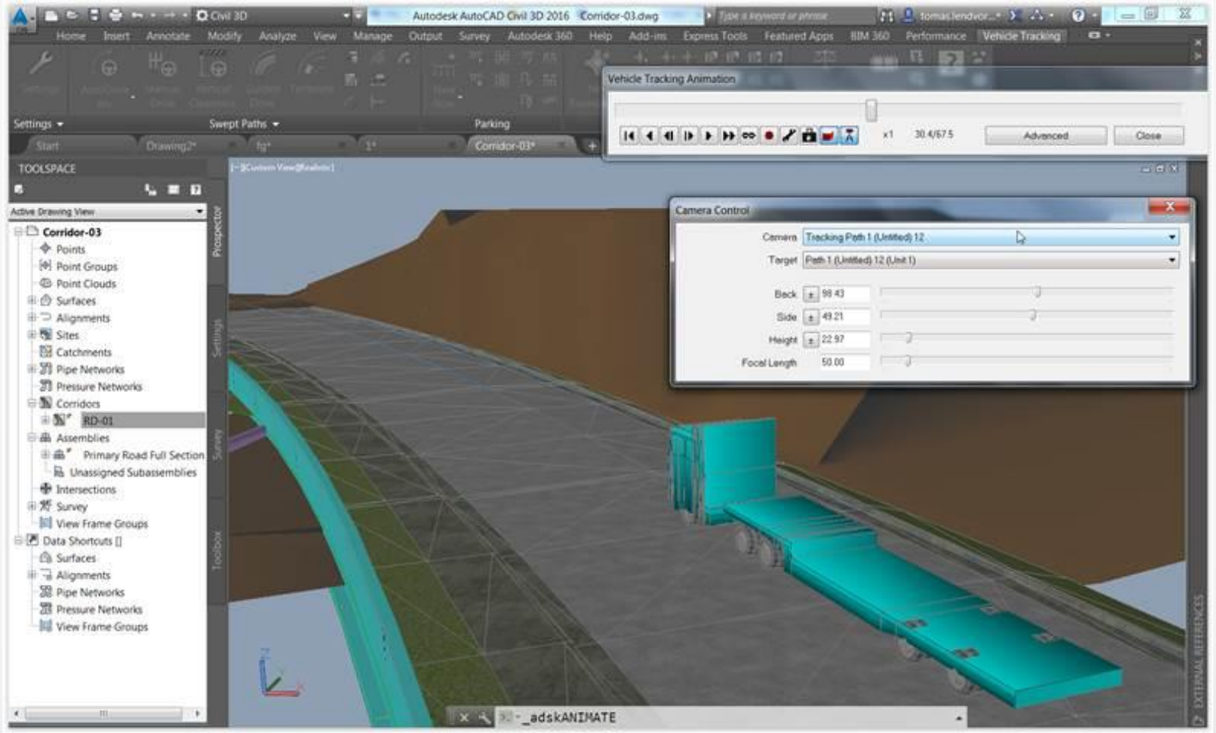
- Convert RFA to DWG
- Model Trailer deck
- Create one Block containing Deck and Load
- Use 3D Block as Body Outline (side elevation)



Excersise 4

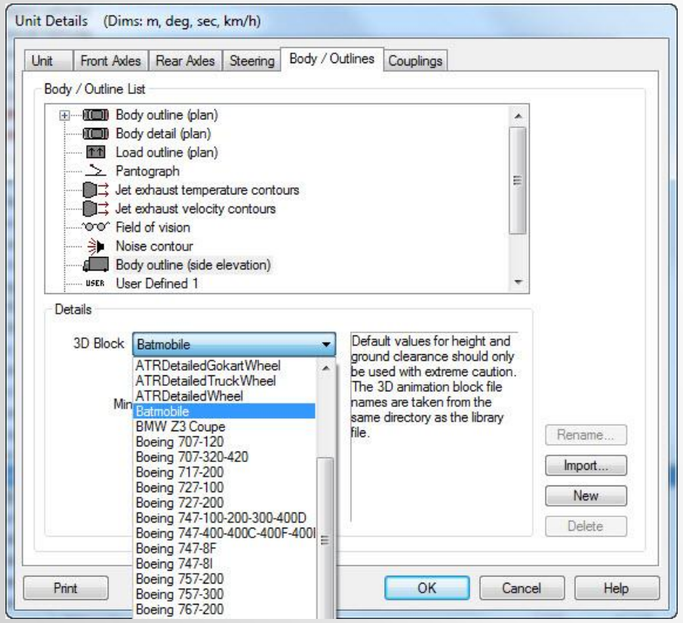
User defined Body Outline - Animation

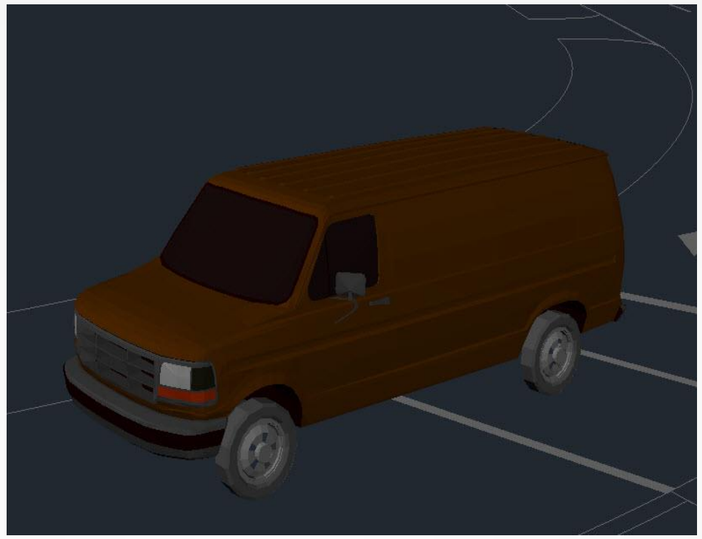
- Acad 2016 enables to reference Navisworks model
- Vehicle tracking will enable Animation within aggregated model



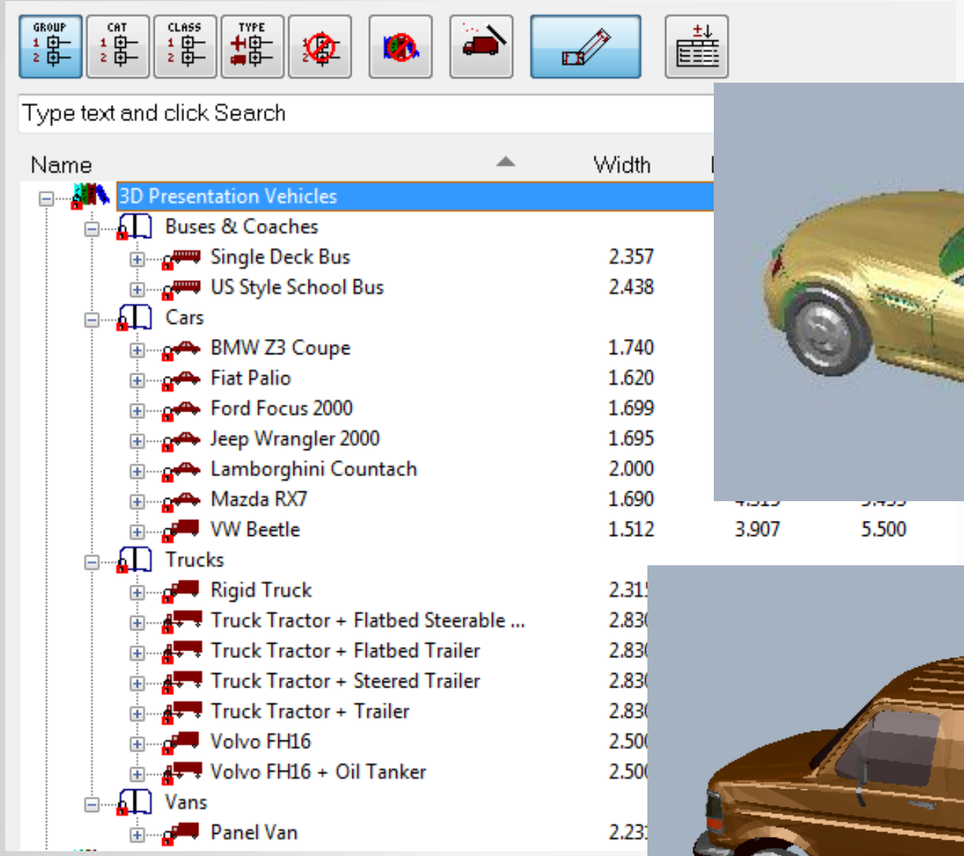
Enhancing the vehicle's appearance

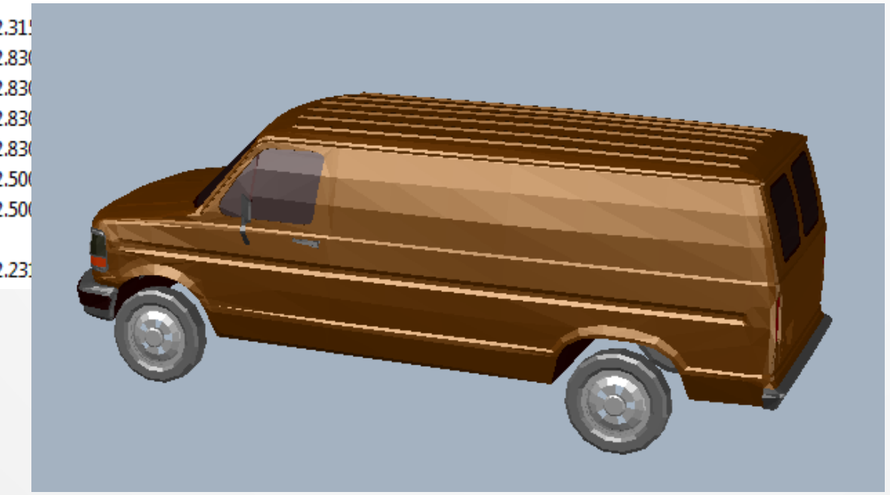
3D blocks can be added to the vehicle in the Advanced Vehicle Editor to make the animations more realistic

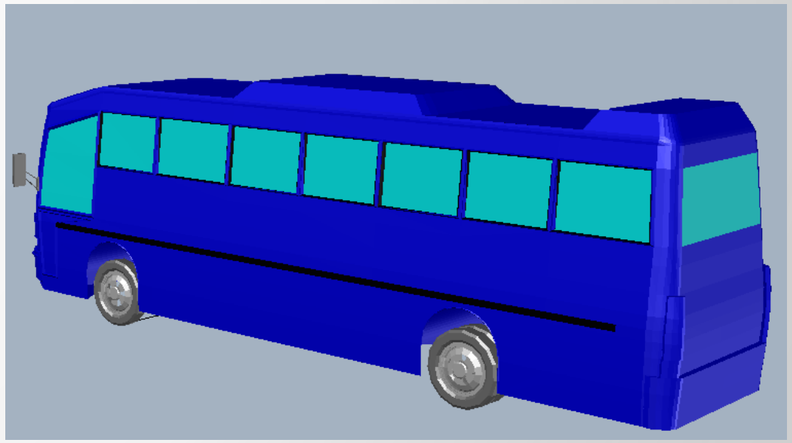




New 3D Presentation Vehicles – Subscription benefit

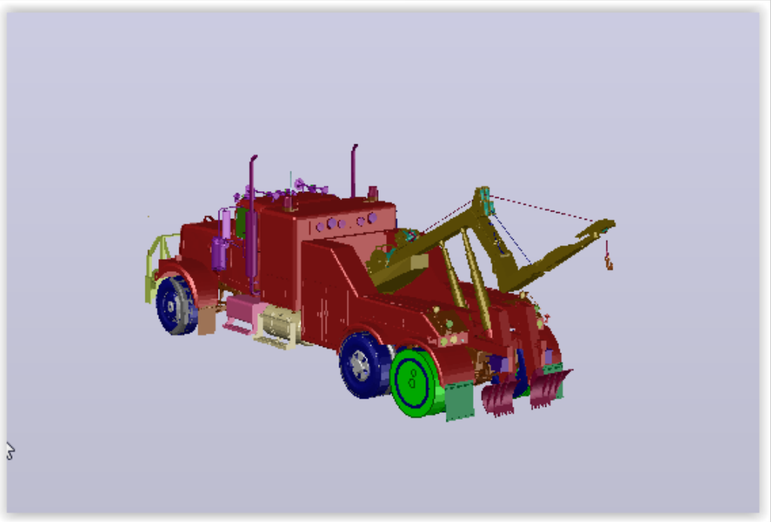


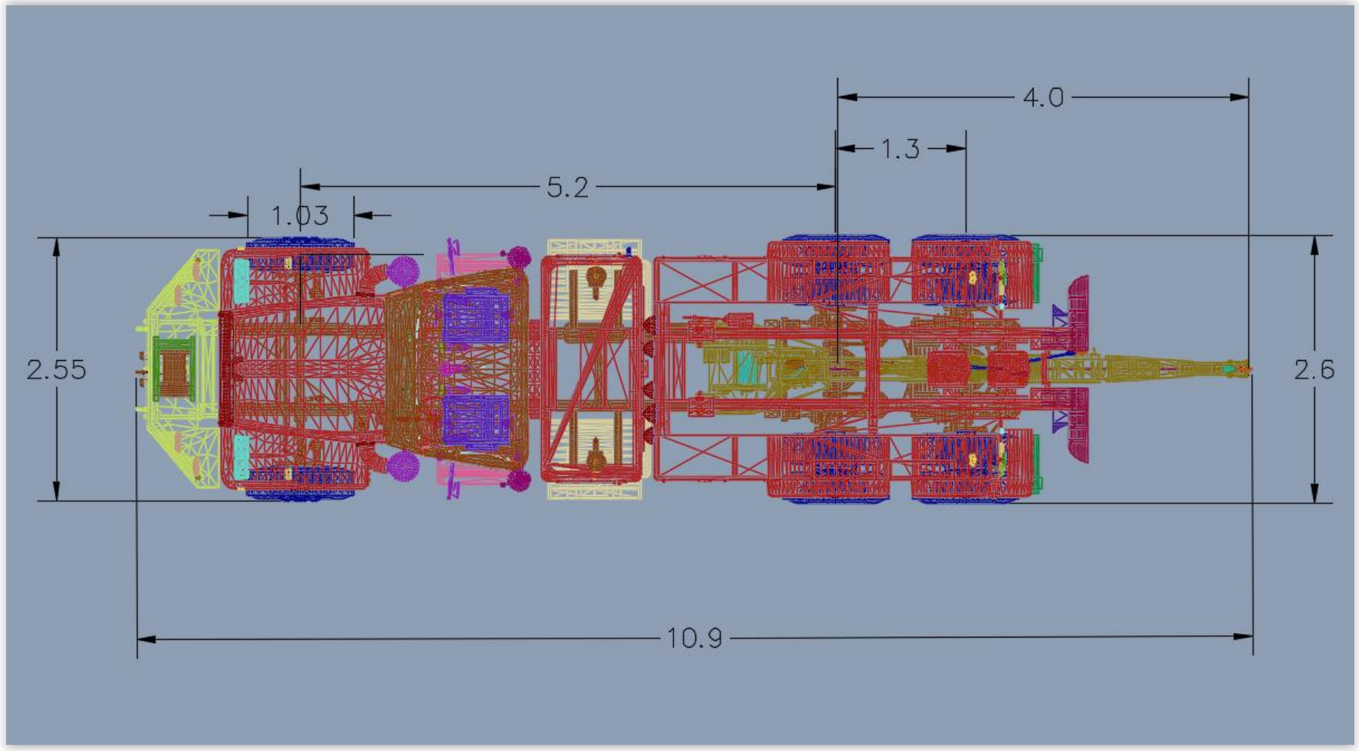




User defined Presentation vehicles

- Export model from 3ds Max
- Create vehicle with correct dimensions
- Create Acad block

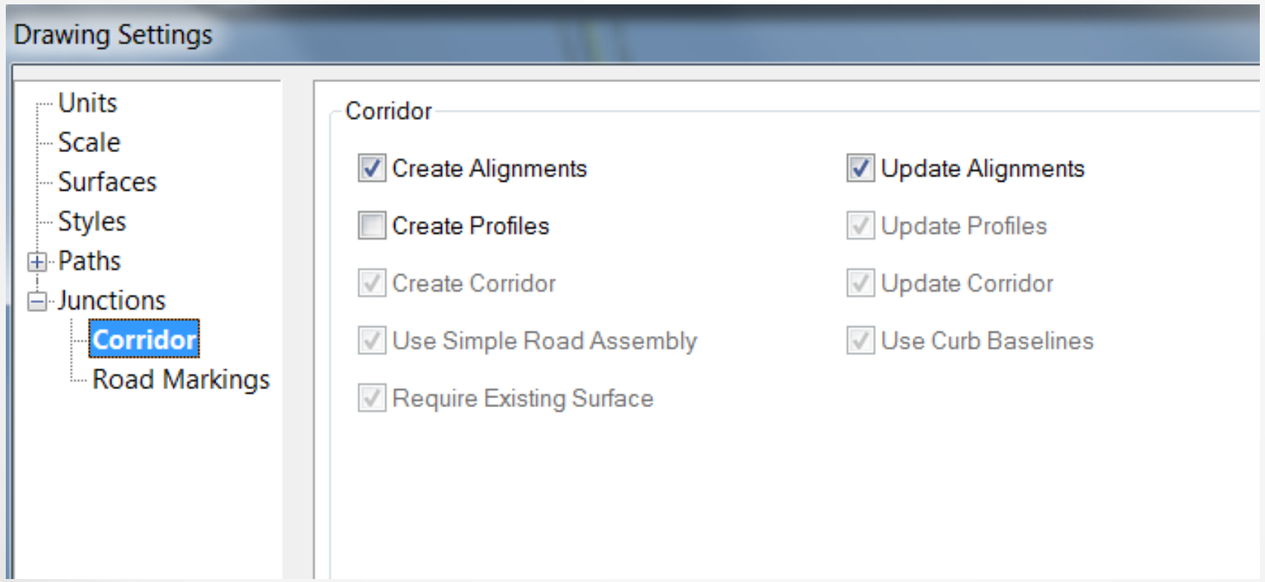




Roundabout

Roundabout Design

- AutoCAD environment – 2D
- Civil 3D environment – 2D or 3D



Roundabout Construction Elements

- Assemblies

C:\ProgramData\Autodesk\Vehicle Tracking 2016\Library\Assemblies\Civil3D2016

- Signs

C:\ProgramData\Autodesk\Vehicle Tracking 2016\Library\Signs

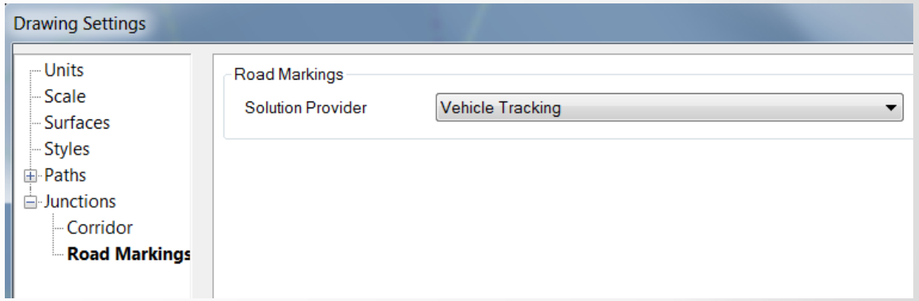
  - ✓ .DWG
  - ✓ .JPG
  - ✓ .INFO

Roundabout Construction Elements

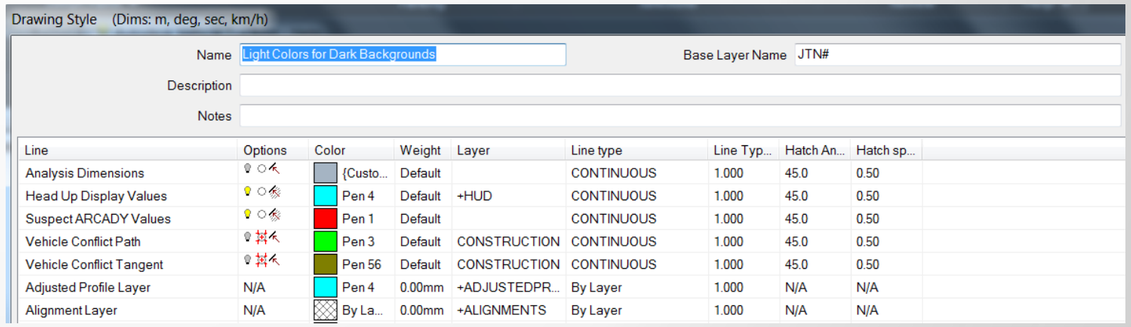
- Road Markings

C:\ProgramData\Autodesk\Vehicle Tracking 2016\Library\Linage

Drawing Settings control:
Provider



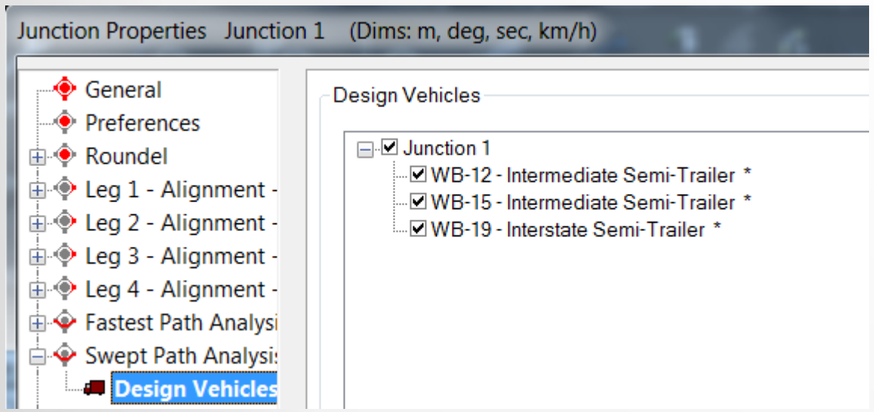
Styles (Layers)

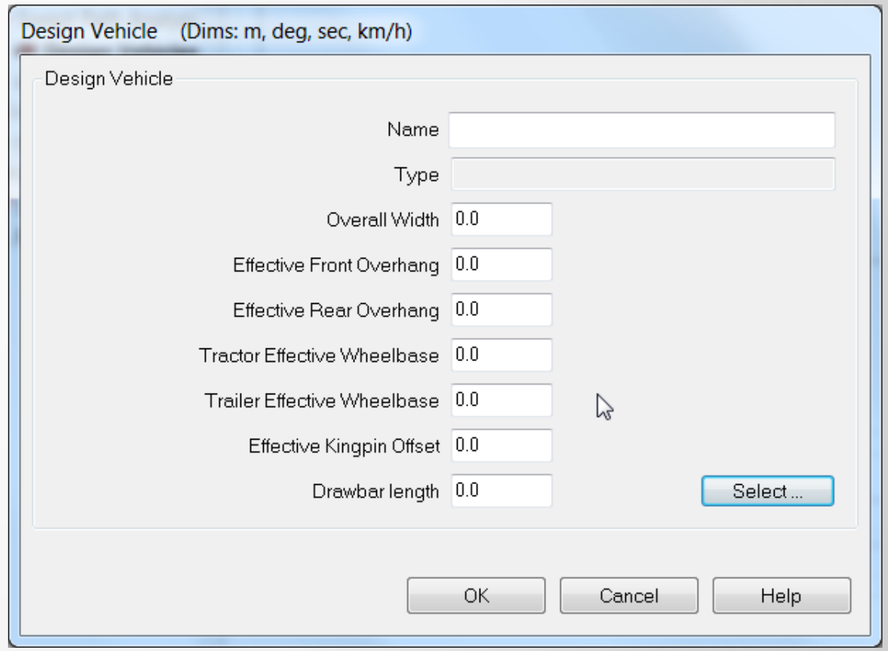


Roundabout - Analysis

- Design Vehicle

Vehicles used for automatic Swept path analysis

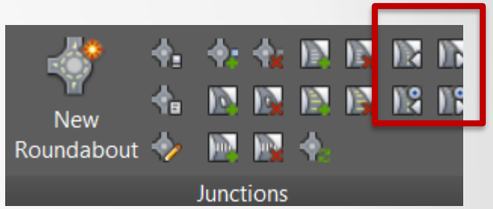


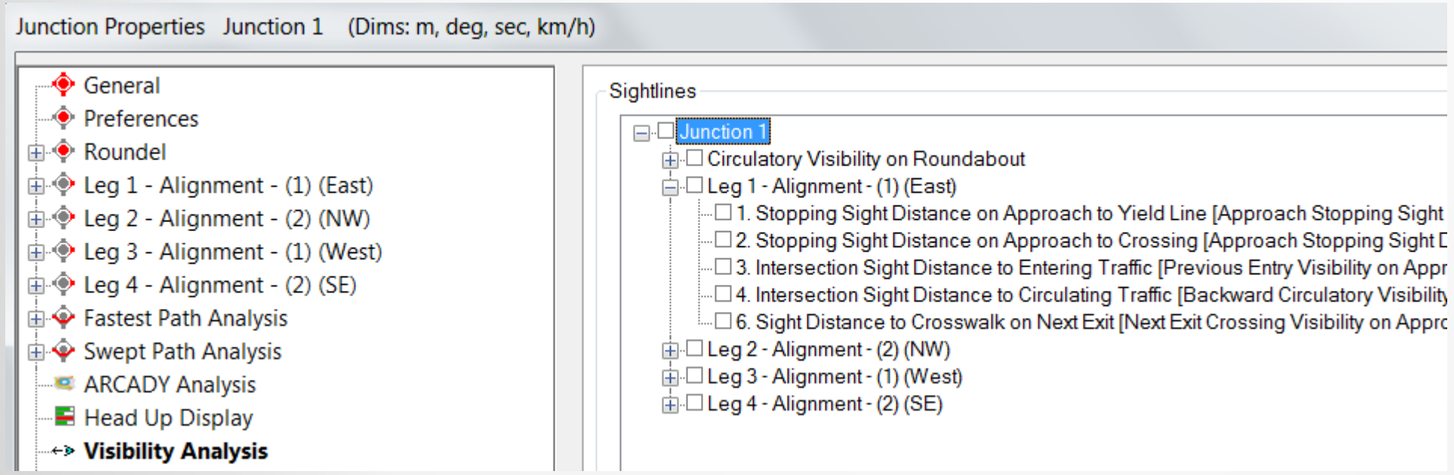


Roundabout - Analysis

- Visibility Analysis

Sight distances
All generated automatically – must be toggled





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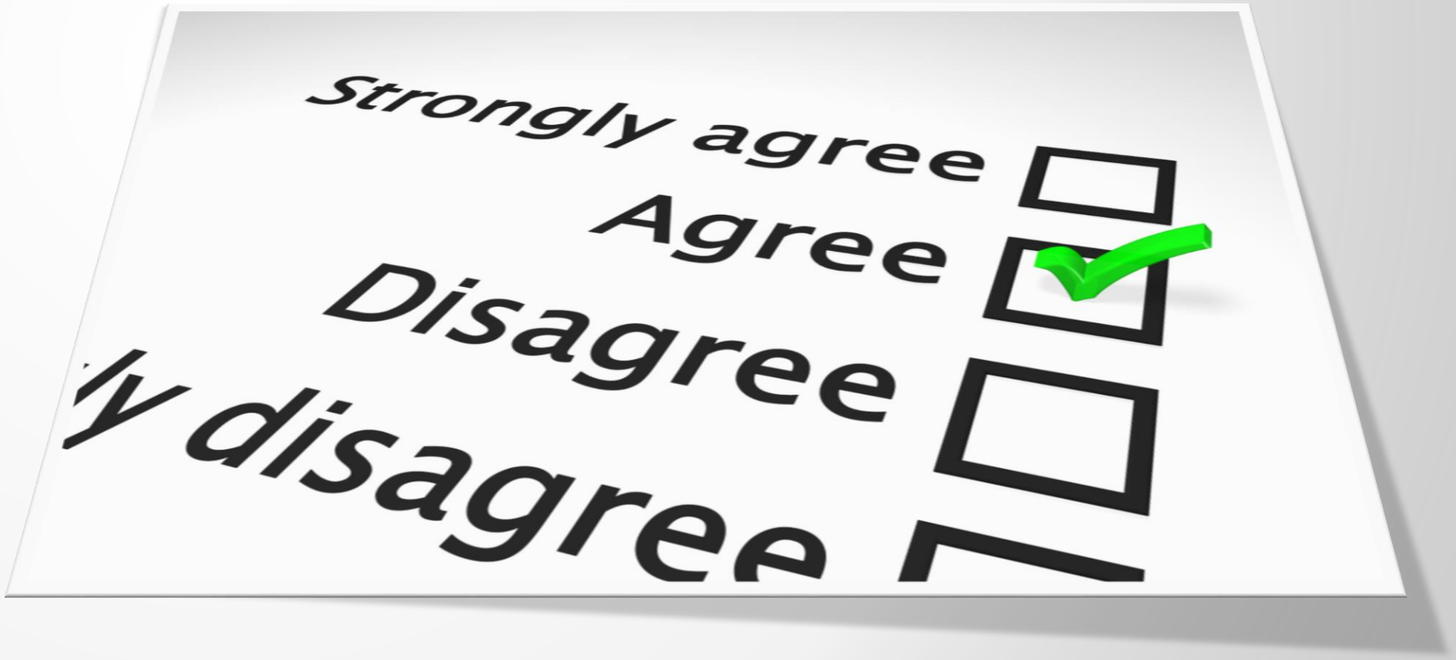
- AU 2016 passes awarded daily!
- Give your feedback after each session.
- Give instructors feedback in real-time.



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