TURN V6.3

Reference Manual

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Introduction

Welcome to Civil Designer, the design system created by civil engineers for civil engineers, to save you time, effort and money. Now you can work faster, smarter and accomplish more.

This manual introduces you to Civil Designer and gets you up and running without delay. It shows you how to accomplish the most common tasks and provides tips on the exciting and innovative new features to be found in Civil Designer.

The easy-to-follow tutorial will help you gain hands-on experience with the program, and the Beyond the Basics section shows you how to complete advanced tasks.

Where do I go from here?

After reading this manual you should know the following:

- How to get Civil Designer up and running
- How to use the menus and the on-line help system
- How to input and edit data files
- How to start a track simulation
- How to view and output the results of the simulation

Typefaces in this manual

The different typefaces in this manual are used as follows:

`Monospace`	This typeface represents text as it appears onscreen such as prompts.
Italics	Italics are used for emphasis and to introduce new terms.
[Enter]	This indicates a key on your keyboard. For example: "Press [Enter] to complete the entry."
Command	This typeface indicates a menu option or a command. For example: "Click on the Open icon to load a drawing."

Menu commands appear with the path separated by an arrow. The instruction Draw ► Ellipses ► Ellipse refers to the path you follow by opening the Draw menu, the Ellipses sub-menu, and by choosing the Ellipse option.

How to get support

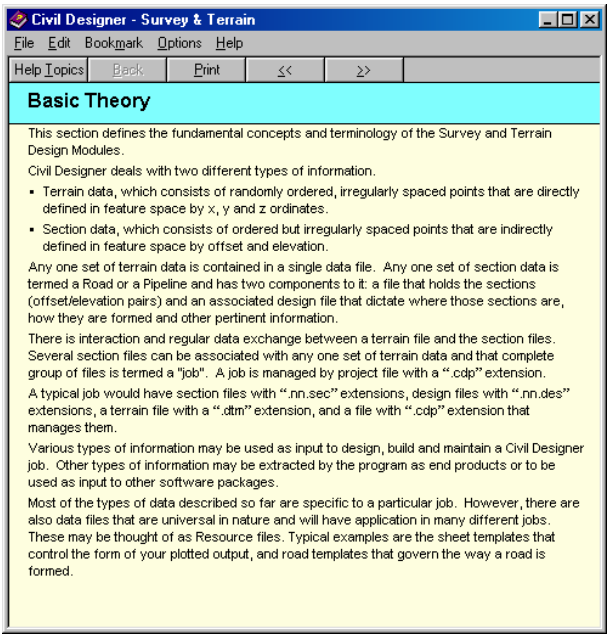
Technical support is available from 08.00 to 17.00 Mondays to Fridays excluding public holidays at the Knowledge Base Support Centre at 086

On-line help

The Civil Designer on-line help system is far easier to use and more comprehensive than those typically found in other software programs.

It contains about *10 times* as much information as this manual and provides complete answers to virtually any question you may have about features or how to use **CIVIL DESIGNER**.

Access on-line Help from the Help menu option at any time, or by pressing F1 during the display of any of the dialogs in the program. The help items can be printed using the File ► Print option of the Help window or the Print button on the toolbar.



Online documentation

The User Guide and the Reference Manual are supplied on the CD-ROM in Adobe Acrobat PDF format. You have the option to install the Acrobat Reader when installing Civil Designer. This allows you to browse through the manual, to search for specific subjects, and to print out all or any selection of pages.

Conventions used in this manual

Menus and functions

All the functions in Civil Designer are described in detail in the online Reference Manual.

Mouse

In this manual, clicking refers to clicking with your *left* mouse button unless otherwise specified. When a click with your *right* mouse button is required, the terms *right click* or *right clicking* are used.

Clicking means to press and release a mouse button quickly.

Cross references

When a function is mentioned, it is mentioned together with the menu in which it can be found. For example, see *Line (Chained)* in the Reference Manual means that the Line (Chained) function is described in the Reference Manual.

See *Accurate Drawing* means that you should refer to the chapter on Accurate Drawing in your Civil Designer User Guide.

Diagrams

All diagrams are shown with the cursor in Freehand mode except where Civil Designer automatically uses another mode. However, other modes may be used (see *Snap Modes* in the Reference Manual).

Reference

The Civil Designer Turn program is an integrated module of Civil Designer which simulates low speed turning maneuvers of user defined vehicles along a specified tracking path.

This chapter describes each function in detail.

Defining a Tracking Path centre line

A tracking path is the path that will be used in simulating vehicle movement. This path can be defined by drawing lines and arcs in CAD. There are however a couple of guidelines to be followed in doing this:

- The tracking path must start and end with a straight line.
- For reverse simulation around a curve has to be done, a straight line must follow each curve.
- The path can be drawn in any CAD layer, but it makes sense to draw it in a separate layer.

It is a good idea to use the Draw ► Line arc line function in CAD for this purpose.

The tracking path that has been drawn must now be coordinated before a simulation can be done. This is done using the Turn ► Define Path menu option.

Auto Define

Select the Turn ► Define Path ► Auto Tracking option from the main menu, or Right click on the Define path icon on the Turn toolbar.

Use the Auto Define function if the path has been drawn in the same sequence as the desired vehicle movement. You will be prompted to indicate the start of the path and the program will automatically track the path and coordinate it.

Manual Define

Select the Turn ► Define Path ► Manual Tracking option from the main menu, or Left click on the Define path icon on the Turn toolbar.

Use this option if Auto Define did not give the desired result. This function will prompt you to indicate each line or arc in sequence of vehicle movement.

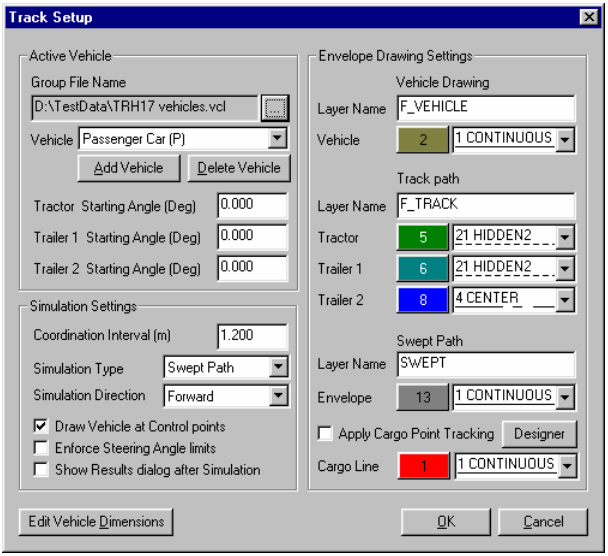
Right click to indicate the end of the path.

As you define the path using either one of these options, the elements will be highlighted to enable you to verify the result. The coordination will be done according to the *Coordination Interval* value specified in the Setup dialog.

Remember that it will be impossible for a driver to exactly follow a pre defined tracking path along a real roadway. Therefore, the results must be used rather conservatively and extra allowance beyond the generated envelopes must be made for driver variation according to sound engineering discretion.

Turn Setup

Press the Setup icon on the Turn toolbar, or select the Turn ► Setup option from the main menu to display the Setup dialog.



Active Vehicle

Specify the Vehicle Group File Name to be used, using the File Open dialog when clicking the File […] button.

When a Vehicle group file is specified an Active vehicle, can be selected from the *Vehicle* combo box. Click on the *Add Vehicle* option to add a new vehicle to the current Vehicle Group file. A vehicle can also be deleted from the group file by clicking the *Delete Vehicle* button.

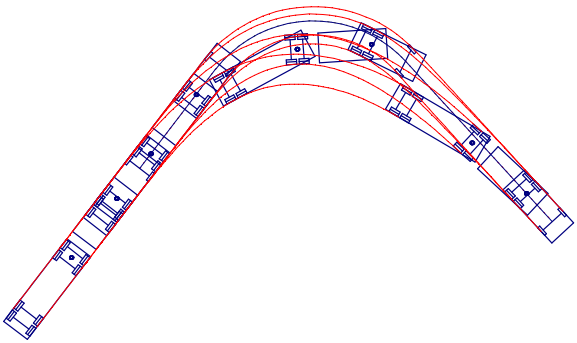
The Angle (decimal) at which the vehicle and trailers must start the simulation can be specified in the *Tractor Starting Angle*, *Trailer1 Starting Angle* and *Trailer2 Starting Angle* edit boxes. These options only apply when forward vehicle movement is simulated.

The interval, at which the defined track path must be coordinated, can be specified in the *Coordination Interval (m)* edit box. If you make this value small (0.3 to 0.1m) the simulation will be accurate but slow. The program will also add more line entities to the drawing structure.

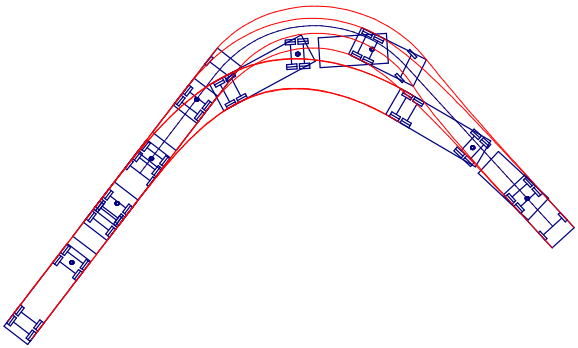
Care must be taken when simulating an articulated vehicle movement in the reverse direction, especially if the kingpin location is in front of the rear axle, not to make the coordination interval to small (at least equal to the distance between the rear axle and king-pin). A good average Coordination interval is in the vicinity of 0.2 to 1.5 m.

Use the *Simulation Type* combo box to specify the type of simulation needed. This option can be set to:

- **None**
  Nothing will be drawn.
- **Track Path**
  The position of the wheels of the vehicle and trailers along its path will be drawn.



- **Swept Path**
  The amount of space the vehicle and trailers will take up during the movement will be illustrated.



The *Simulation Direction* can be set to either Forward, or Reverse. This direction refers to the vehicle itself and not the direction in which the vehicle travels on the track path.

If the *Draw Vehicles on Control Points* checkbox is checked, a vehicle diagram will be drawn at the start and end of each curve and transition curve.

If the *Enforce Steering Angle limits* checkbox is checked, the program will stop the simulation and warn the user when the maximum steering angles are exceeded. If this option is unchecked, simulation will continue regardless of the steering angles along the tracking path.

Select the *Show Result dialog after Simulation* to display the Result dialog after each simulation.

Envelope Drawing Settings

The drawing layer, line type and pen colour can be specified for each of the simulation types specified in the *Simulation Type* combo box, as well as the Vehicle diagram.

When the *Apply Cargo Point Tracking* check box is checked the program will track a point specified in the Cargo point Tracking dialog along the specified tracking path. This

tracking line will be drawn in the specified line type and pen colour.

Select *Run Simulation* to do point tracking in the forward, or reverse direction. Point tracking can be done on its own, or in conjunction with either the swept, or track path. Press the *Designer* button to display the Cargo Point Tracking Designer dialog box where the position of the cargo point relative to the active vehicle can be specified.

The Vehicle Dimension dialog can be displayed directly from this dialog by pressing the *Edit Vehicle Dimensions* button.

Creating a new Vehicle File

A Vehicle file is an ASCII file, which can be edited in any text editor. It can contain a number of user-defined vehicles, which will be used when simulating vehicle movement along a pre-defined tracking path. These files have a *.vcl file extension. A standard vehicle file containing some TRH 17 vehicles is supplied with the program.

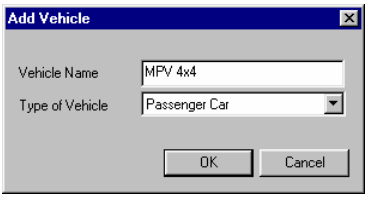
To create a new Vehicle file, select the Turn ► Setup from the main menu to display the setup dialog. Click on the File button next to the file name edit box to display a Windows File Open dialog. In this dialog you can either select an existing file, or specify a new file name, which will be created automatically.

Once the file has been created you will be returned to the Setup dialog. If you created a new file, it will be totally empty and there will be no vehicles listed in the *Vehicle* combo box.

Add a Vehicle to a Vehicle File

The Turn vehicle group file (*.VCL) is totally user configurable. You can add, edit or delete vehicles at any time.

Press the *Add Vehicle* button on the Setup dialog.



Enter a name for the new vehicle in the *Vehicle Name* edit box. This name (32 characters long) will be listed in the Vehicle combo box in the Setup dialog. In the *Type of Vehicle* combo box, specify the type of vehicle that has to be added.

There are 13 standard vehicle types, which will determine the bitmap in the Vehicle Dimensions dialog as well as the profile symbol that will be used when running Add Profile. This setting will also be used in doing a realistic simulation. You may have more than one vehicle in a Vehicle File of the same type, as long as they have different Vehicle Names.

Press OK to enter dimensions for the newly added vehicle using the Vehicle Dimension dialog.

Running a Simulation

Select the Turn ► Run Simulation option from the main menu or press the Run Simulation icon from the Turn toolbar to simulate a vehicle movement.

The Vehicle movement of the Active Vehicle will be simulated along a pre-defined track path in the direction specified in the Setup dialog.

The direction in the Setup dialog can be set to either forward, or reverse. This direction refers to the vehicle itself and not the direction in which the vehicle travels on the track path.

While the simulation is taking place the program will constantly check whether the vehicle exceeds its maximum steering angle as well as the maximum angles between the tractor and trailers.

When these maximum angles are exceeded, the program will stop the simulation and prompt a reason why it has stopped. This action can however be override by disabling the *Enforce Steering Angle limits* check box in the Setup dialog.

Forward Movement

When the vehicle is moving in a forward direction, the center point of its front axle will always be on the specified track path. The angle of its front wheels will always be parallel to the tangent line on a circle or parallel to a straight line.

The rear wheels of the vehicle will always follow a straight line between its current position and the previous position of the front wheels. The same rule applies when there are trailers connected to the vehicle.

The assumption is made that the vehicle is moving at vary low speed (parking speed). When a vehicle then enters a curve, the driver will be able to turn the wheels in the new direction within a neglect able short distance therefore no transition curves have to be used for forward motion.

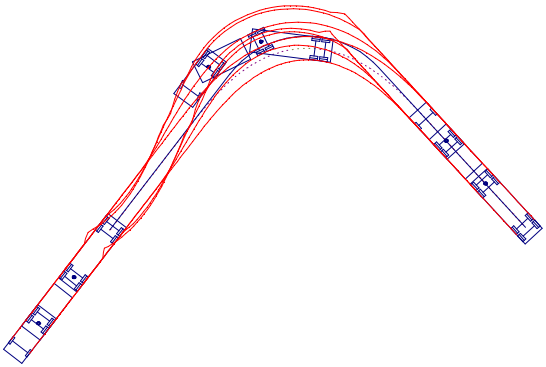
Reverse Movement

In the reverse direction the center point of the rear axle of the vehicle, or last trailer will follow the track path. This rear axle will always be perpendicular to the tangent line on a circle, or straight line. This also determines the angle at which the vehicle is traveling and the angle of the steering wheels will then be calculated accordingly.

When there are trailers connected to the vehicle, it is no longer safe to assume that no transition curve is needed although the vehicle is moving at vary low speed. The driver of the vehicle must maneuver the vehicle in such a way that it pushes the trailer into the curve.

In order to perform such a maneuver, there must be a transition period before the trailer enters, or exits the circular curve. This also means that the center of the trailer's rear axle will no longer follow the defined path exactly around the circular curve.

This discrepancy depends on the length of the transition curves, which the program will calculate according to the maximum steering angle of the vehicle. This will ensure that the transition curves and therefore the discrepancy be kept as short as possible.



The direction of movement, active vehicle and the coordination interval can be changed without re-defining the track path. The program will automatically re-coordinate the track path and insert transition curves when needed.

Because a driver can successfully negotiate the same turn in different ways, additional allowance must be made for driver variability, according to sound engineering judgment over and above what might have been made during forward maneuvers.

When simulating trailer or semi trailer reverse maneuvers, extra clearance of +- ¾ of the vehicle width should be applied on each side of the envelope.

Add a Vehicle Profile

A vehicle profile is a symbol of the active vehicle, similar to the drawing in the Vehicle Dimension dialog that can be placed onto the main drawing.

These symbols exist in a symbol drawing which is supplied with the program called *VehicleSymbols.drg* and will be stored in the *Symbols* sub-directory of the installation directory.

Select the Turn ► Add Profile option from the main menu, or press the Add Simulation icon on the Turn toolbar to add a vehicle profile.

You will be prompted to indicate the position where you want the profile to be placed as well as the desired rotation.

Delete Simulation

Select the Turn ► Delete Run option, or press the Delete Simulation button on the Turn toolbar to delete the last simulation. The CAD layers for the Track Path, Swept Path and Vehicle Drawing as specified in the Setup dialog will be deleted.

Vehicle Dimension Dialog

Select the Turn ► Vehicle Dimension option from the main menu or press the Vehicle Dimension icon on the Turn toolbar to display the vehicle dimensions of the active vehicle.

There are 13 standard vehicle types, which can be used to define most standard vehicles. You can have more than one vehicle in the group file from the same vehicle type, as long as each vehicle name is unique. These vehicle types, dictates the format of the Vehicle dimension dialog as well as the simulation process.

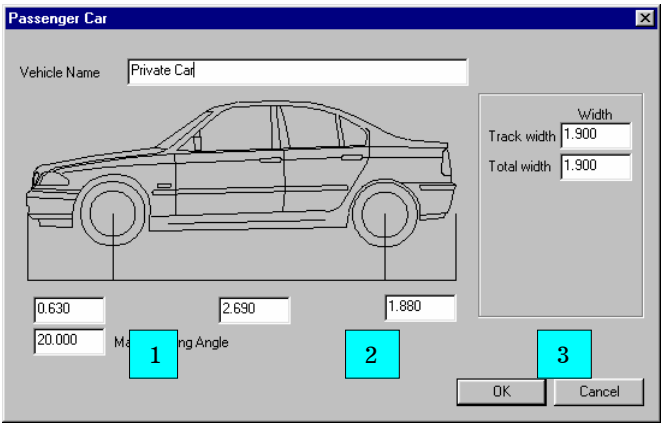
All the dimensions on these dialogs as well as the Vehicle Name can be edited and will be stored in the Vehicle Group File when OK is pressed. When changing the Vehicle name, you can either change the name of the current vehicle, or create a new vehicle with the changed name.

The 13 vehicle types can be sub-divided into 5 main groups namely, Single Unit Vehicles, Articulated Vehicles, Vehicles with full trailers, Vehicles with semi-trailers and Aircraft. These vehicle groups will be discussed subsequently.

Single Unit Vehicles

The following vehicles are single unit vehicles:

- Passenger Car
- Single Unit Truck
- Single Unit Bus
- Forklift
- Tractor vehicles for the other vehicle groups



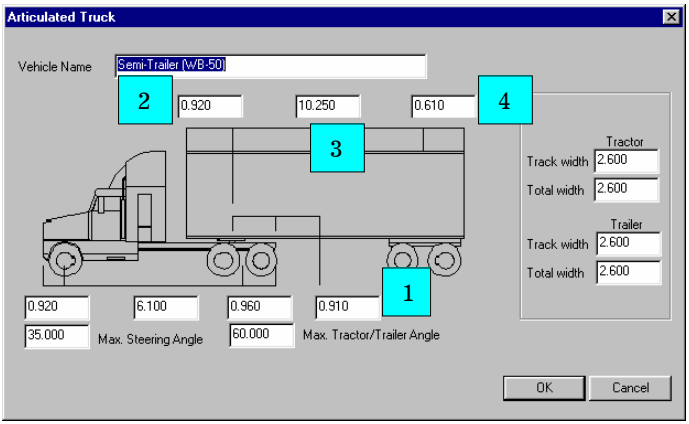
Dimension 1	Front Overhang. The distance from the center of the front wheel to the front bumper
Dimension 2	Wheelbase. The distance between the center of the front wheels and the center of the rear axle group.
Dimension 3	Rear Overhang. The distance from the center of the rear wheel to the rear bumper
Max. Steer Angle	The maximum angle (in degrees) that the steering wheels can be turned to either side.
Track Width	The distance from the outer-most point of the right wheel to the outer-most point of the left wheel.
Total Width	The greatest width of the vehicle's body.

The Forklift Vehicle type steers with its rear wheels.

Articulated Vehicles

The following vehicles are articulated vehicles:

- Articulated Truck, with or without trailers.
- Articulated Bus

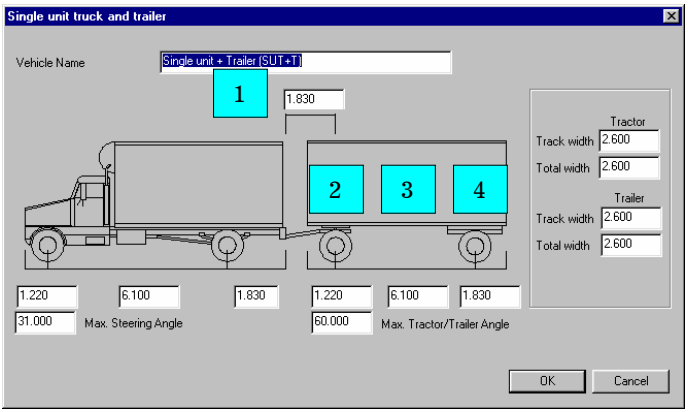


Dimension 1	The distance rear bumper of the tractor to the center point of the kingpin.
Dimension 2	The distance from the center of the kingpin to the front of the trailer.
Dimension 3	The distance from the center of the kingpin to the center of the trailer's rear axle group.
Dimension 4	The distance the center of the trailer's rear axle group to the trailer's rear bumper.
Max. Tractor/Trailer Angle	The maximum allowable angle (in degrees) between the tractor and trailer.
Track Width	The distance from the outer-most point of the right wheel to the outer-most point of the left wheel.
Total Width	The greatest width of the trailer's body.

Vehicles with full trailers

The following vehicles are vehicles with trailers:

- Single Unit Truck \ Trailer.
- Articulated Truck \ Trailer.

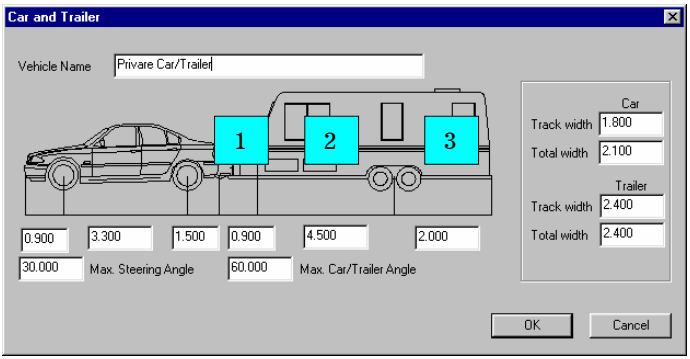


Dimension 1	The Distance from the tractor's tow bar to the trailer's front axle.
Dimension 2	The distance from the trailer's front axle to the front of the trailer's body..
Dimension 3	The distance between the trailer's front axle and the trailer's rear axle group.
Dimension 4	The distance from the trailer's rear axle group to the trailer's bumper.
Max. Tractor/Trailer Angle	The maximum allowable angle (in degrees) between the tractor and trailer.
Track Width	The distance from the outer-most point of the right wheel to the outer-most point of the left wheel.
Total Width	The greatest width of the trailer's body.

Vehicles with Semi-Trailers

The following vehicles are vehicles with semi-trailers:

- Passenger Car\Semi-Trailer.
- Single Unit Bus \ Semi-Trailer.



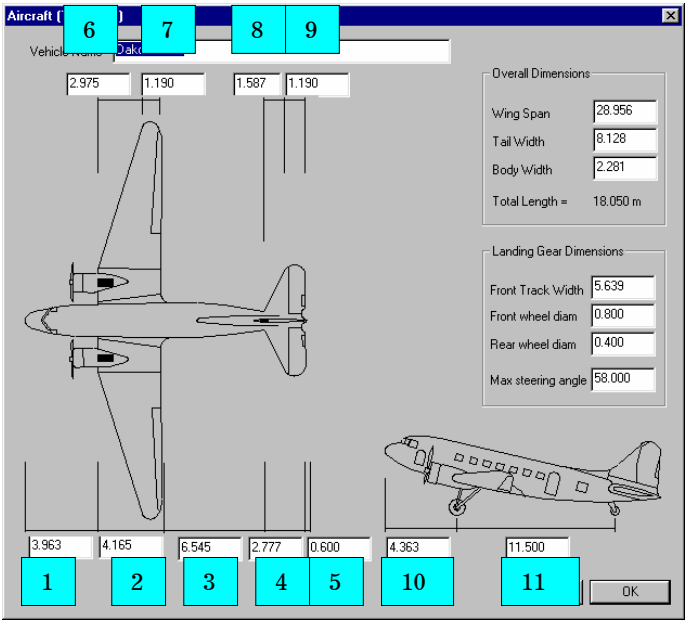
Dimension 1	The Distance from the tractor's tow bar to the front of the trailer's body.
Dimension 2	The distance from the front of the trailer's body to the center of the trailer's axle group.
Dimension 3	The distance from the trailer's rear axle group to the trailer's rear bumper.
Max. Tractor/Trailer Angle	The maximum allowable angle (in degrees) between the tractor and trailer.
Track Width	The distance from the outer-most point of the right wheel to the outer-most point of the left wheel.
Total Width	The greatest width of the trailer's body.

Aircraft

The following vehicles are aircraft:

- Aircraft (Nose Steer).
- Aircraft (Tail Steer).

Two aircraft vehicle types have been added to the list. The first for aircraft with the normal tricycle undercarriage, that steers with the nose wheel. The second aircraft type is for aircraft where the main landing wheels are situated at the front and steers with the tail wheel (i.e. tail draggers).



Plan View

The dimensions at the **bottom** of the drawing indicate positions where the wings and tail are attached to the aircraft's body.

Dimension 1	Distance from the nose to the base of the wing.
Dimension 2	Width of the wing against the aircraft's body.
Dimension 3	Distance between the back of the wing and the base of the tail.
Dimension 4	Width of the tail against the aircraft's body.
Dimension 5	Distance from the back of the tail to the tip of the tail.

The sum of these dimensions is equal to the total length of the aircraft.

The dimensions at the **top** of the drawing specify the positions of the wing tips and tail tips relative to the base of the wings and tail.

Dimension 6	The Distance from the base of the wing to the front point of the wing tip.
Dimension 7	The width of the wing at the wing tips.
Dimension 8	The Distance from the base of the tail to the front point of the tail tip.
Dimension 9	The width of the tail at the tail tips.

Side Elevation

Dimension 10	Front Overhang: Distance from the nose to the center of the front wheel.
Dimension 11	Wheelbase: Distance between the center of the front wheel/s and the center of the rear wheel, or main wheel group.

Overall dimensions

Wing Span	The distance from the left wing tip to the right wing tip.
Tail Width	The distance from the left tail tip to the right tail tip.
Body Width	The width of the widest part of the aircraft's body.

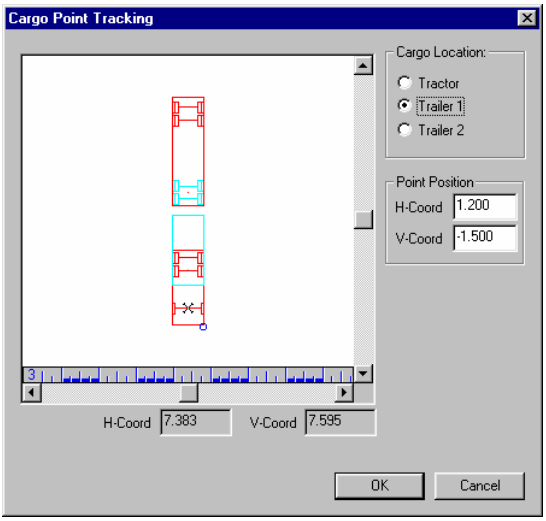
Landing Gear Dimensions

Rear/Front Track width	The distance between the outside edges of the main wheels.
Front wheel diam	The diameter of the front wheel/s.
Rear wheel diam	The diameter of the rear wheel/s

For aircraft with compound main landing wheels, the Front/ Rear wheel diameter should be equal to the total length of the wheel group.

Note: If the position of the pilot has to be tracked, use the Cargo Point Tracking function.

Press the *Designer* button on the Setup dialog to display the Cargo point-tracking dialog.



A plan view of the active vehicle will be drawn on the display area when the dialog opens. You can alter the view in the display area by magnifying (m key), de-magnifying (d key), panning (p key), refreshing (s key) or redrawing (r key).

The 0,0 coordinate is situated at the center of the vehicle's front axle. You can specify the location of the cargo by using the radio buttons in the [Cargo Location] group. The active part location will be highlighted in a cyan pen.

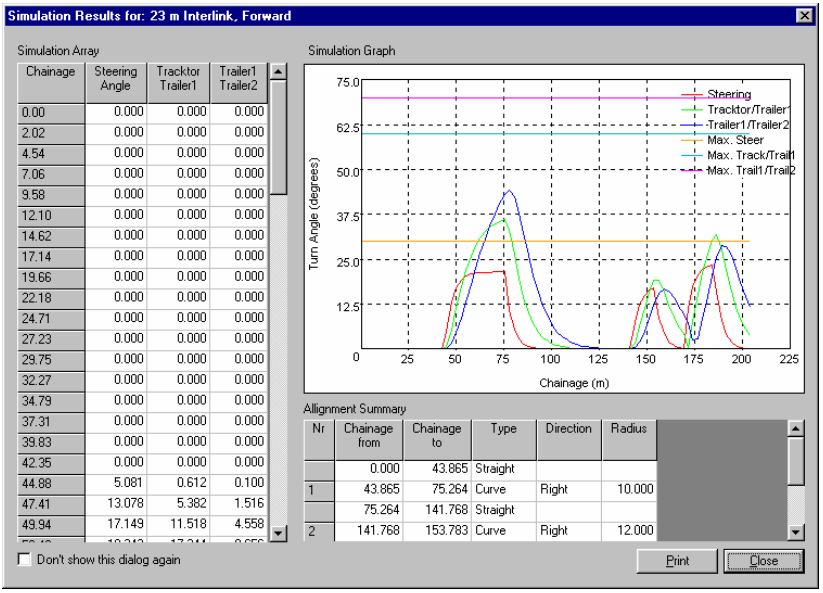
The cargo point can be specified by graphically indicating the position on the display area, or entering the coordinates in the [Point Position] group. You can also snap to the nearest point on the drawing by pressing the "J" key.

A blue circle represents the cargo point that will be tracked when running the next simulation.

Press OK to accept the changes and to return to the Turn Setup Dialog.

Simulation Results

Select the Turn ► Display Results option from the main menu, or press the Results icon on the Turn toolbar.



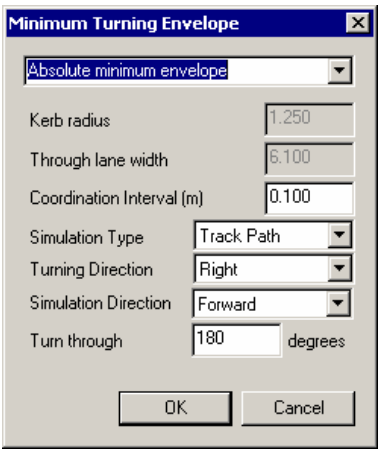
If the *Show Result dialog after Simulation* option was selected in the Turn Setup Dialog, or the *Display Results* menu item was selected and a simulation was done the results dialog will be displayed. Select the *Don't show this dialog again* option not to display the dialog automatically after simulation.

The dialog will graph the turning angles of the various trailers as well as the steering angle of the tractor against the centerline chainage of the track path. The maximum angles as specified in the vehicle dimensions option will also be indicated. The graph and array, as well as an alignment summary can be printed using the *Print* button.

Press Close to close the Results dialog.

Minimum Turning Circle Envelope

Select the Turn ► Minimum Envelope ► Minimum Envelope Setup option, or left click on the Minimum Envelope icon on the Turn toolbar to display this dialog:



The coordination interval and Simulation type can be set in this dialog in the same way as in the main setup dialog. When creating a *Reverse* envelope, the program will automatically calculate the optimum coordination interval for the curve.

The turning direction can be set to either left or right. The [Turn through] option can be set to any angle between 0 and 180 degrees.

When pressing OK you will be prompted to indicate the start point of the envelope, as well as the initial direction of movement before turning through the specified angle and direction.

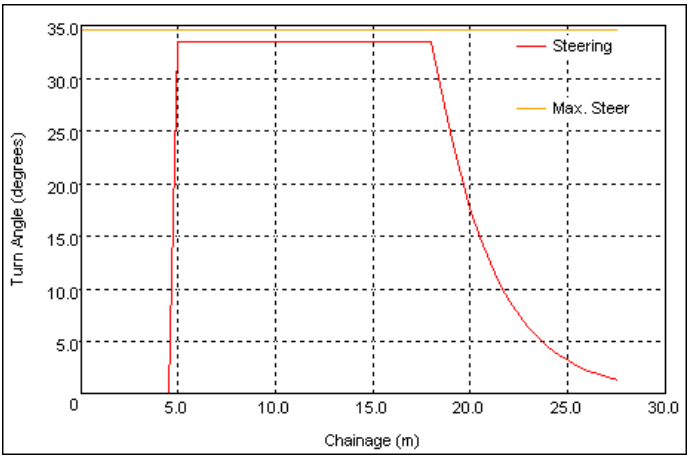
When selecting the Turn ► Minimum Envelope ► Create Minimum Envelope option or right click on the Minimum Envelope icon on the Turn toolbar, the setup dialog will not be displayed and you will be prompted to indicate start point and direction as before. The envelope will be created using the previous settings.

Absolute minimum envelope

The program will simulate a turn at low speeds with the steering wheels at the maximum angle as specified in the vehicle file. It is assumed that the distance in which the steering wheels are turned is neglect ably small, because of the low speed at which the vehicle is traveling.

In a maneuver like this, it is possible (especially with long trailers) that the maximum specified angle between tractor and trailer might be reached. When this happens the program will automatically calculate a new steering angle in order to avoid reaching these maximum angles.

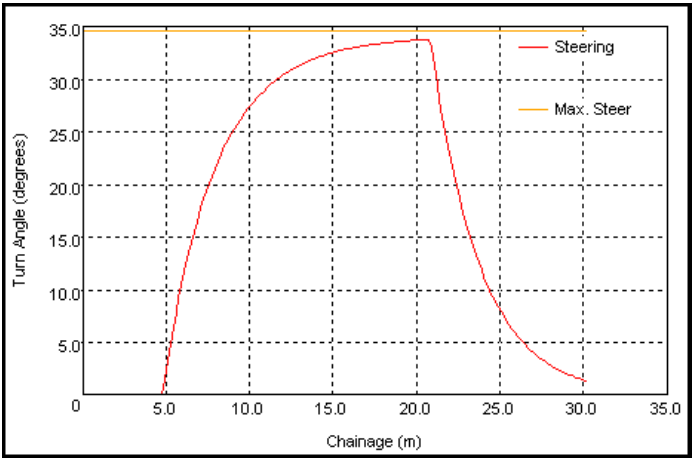
The turning angle graph will look like this:



TRH 17 Template

This method will create a minimum turning envelope in such a way that the outer front wheel will travel exactly on a circular curve, which means that the vehicle reaches its maximum steering angle close to the crest of such a circle.

The turning angle graph will look like this:



Around a Kerb

When running this method, the program will use a specified kerb radius and lane width to calculate the minimum turning envelope for a vehicle that has to turn around the specified kerb.

The following formulas will be used:

$RIR = RK + (W - w) / 2 + 0.6$

$ROF = [(RIR + W)^2 + L1^2 + L2^2]^{0.5}$

Where:

L1	Wheelbase of the Tractor
L2	Wheelbase of semitrailer
w	Track Width
W	Trough lane width
RK	Kerb Radius
RIR	Inner rear track radius
ROF	Outer front track radius

Select the Turn ► Minimum Envelope ► Minimum Envelope Setup option

No pre-defined track path is necessary to run a simulation using this function.

Procedure

The program will prompt:

```
Indicate Vehicle start position.
```

Graphically Indicate the position where the centre point of the vehicle's front axle must be.

The program will prompt:

```
Indicate Vehicle direction of initial movement:
```

A rubber-band will be drawn from the start position to the cursor position. Use the rubber-band to indicate the vehicle's orientation before movement. A vehicle diagram will now be drawn at the start of the simulation.

The Program will prompt:

```
Indicate Waypoint
```

Click on a point where the vehicle must move to. The vehicle will immediately turn its steering wheels toward the indicated point and start moving in that direction. When the steering wheels reach their maximum steering angle, the vehicle will turn at its maximum steering angle, therefore turning at its minimum turning radius, until the wheels can be turned directly towards the waypoint.

The program will repeatedly ask for waypoints, running the simulation from waypoint to waypoint, until you press Esc.

Tutorial 1 – Create a New Vehicle File

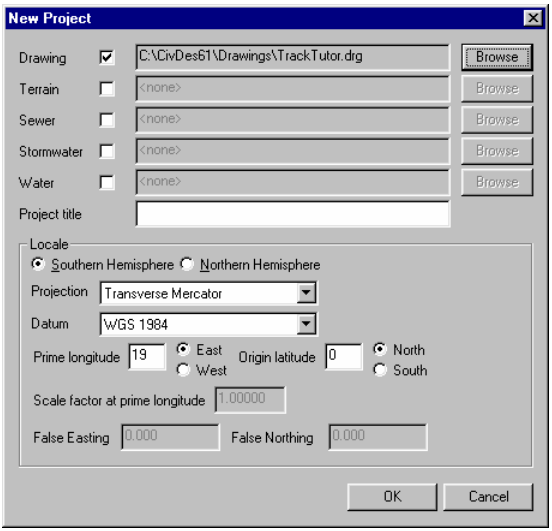
This tutorial will show you haw to create a user defined vehicle group file. You will learn how to:

- Set up a project in Civil Designer / AllyCAD
- Create a new Vehicle Group file (*.vcl)
- Add a User defined vehicle to the file.

Set up a project

A project containing a drawing must be created before the Turn functions can be used.

Select the File ► New Project option in any mode. Check the [Drawing] option and in the File open dialog, specify the drawing to be *C:\CivDes63\Drawings\TrackTutor.drg* and press Open to enter the drawing name into the New Project dialog.

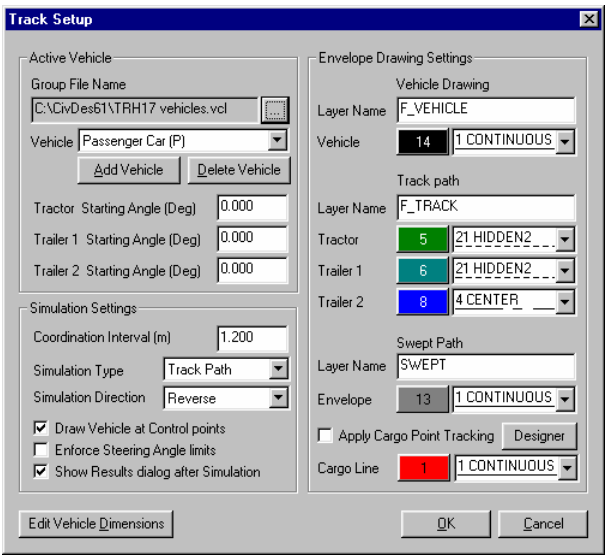


Press OK and create a new project file with the following name:

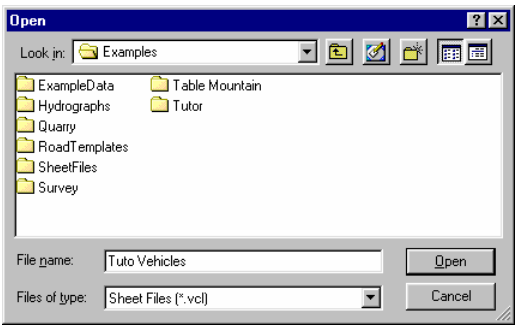
C:\CivDes63\Examplas\TrackTutor.cdp

Create a new Vehicle File

Open the Turn Setup dialog by selecting [Turn][Setup] from the Design Center menu, or press the Setup button on the Turn toolbar.



Press the *File Open* [...] button next to the "Group File Name". Scroll to the "C:\CivDes63\Examples" directory and type the file name "Tutor Vehicles.vcl" into the [File Name] edit box.

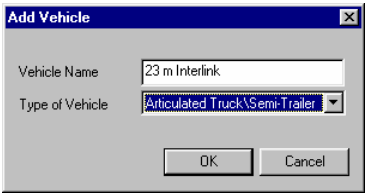


Press [Open] and create a new file. You will then be returned to the Setup dialog.

You just created a new Vehicle group file. Note that the Vehicle combo box in the Setup dialog is empty.

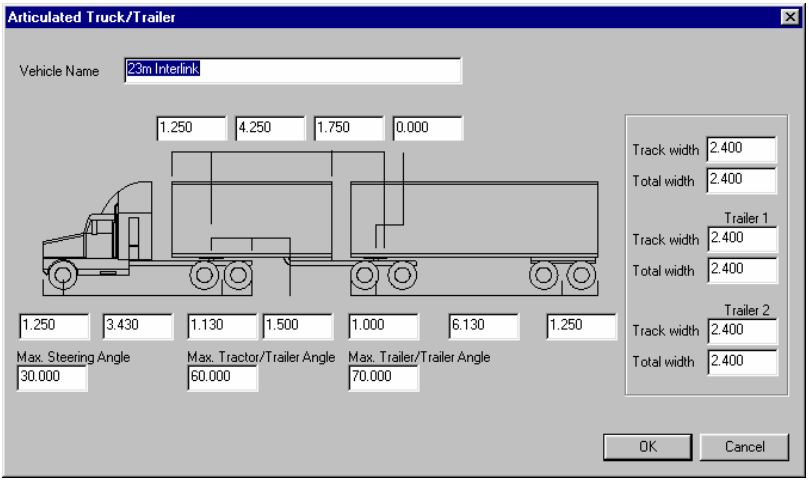
Add a user defined vehicle

We will now add a vehicle to the file. Press the [Add Vehicle] button on the Setup dialog to display the Add Vehicle dialog. Specify the new vehicle name and type as follows:



Press OK to create the vehicle and open the Vehicle dimension dialog.

Edit the Vehicle dimensions as follows:



Press OK to return to the Setup dialog. The new vehicle will now be added to the Vehicle group file and therefore be included in the [Vehicle] combo box. Make sure that the "23 m Interlink" is selected. Press OK to close the Setup dialog.

In this tutorial we created a Vehicle file called "Tutor Vehicles.vcl" which includes a single vehicle called "23 m Interlink".

Tutorial 2 – Run a forward simulation

In this tutorial we will use the vehicle file created in Tutorial 1 and run a forward simulation.

You will learn how to:

- Edit the Turn setup
- Define the track path
- Run the simulation
- Add a Vehicle profile

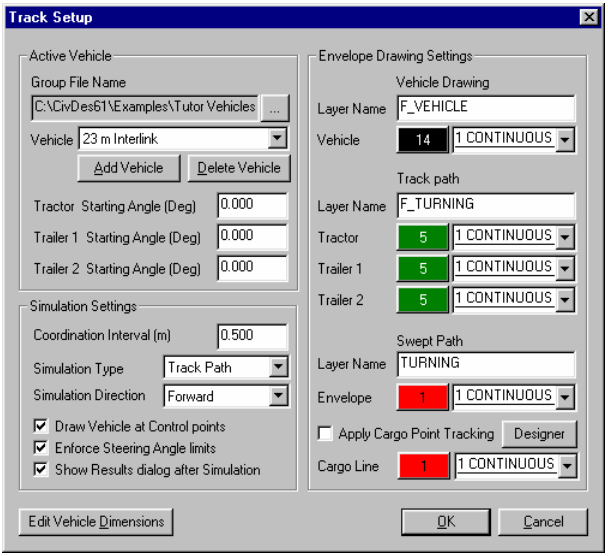
Edit the Turn Setup

Select the Turn ► Setup option or press the Setup button on the Turn toolbar. Make sure the "TutorVehicles.vcl" file is open and the active vehicle is the "23 m Interlink".

Change the *Coordination Interval* and *Simulation Type* to "0.5m" and "Track Path" respectively.

Check the *Draw Vehicles at control points* option to draw a vehicle diagram at every control point on your track path.

Change the rest of the dialog as follows:

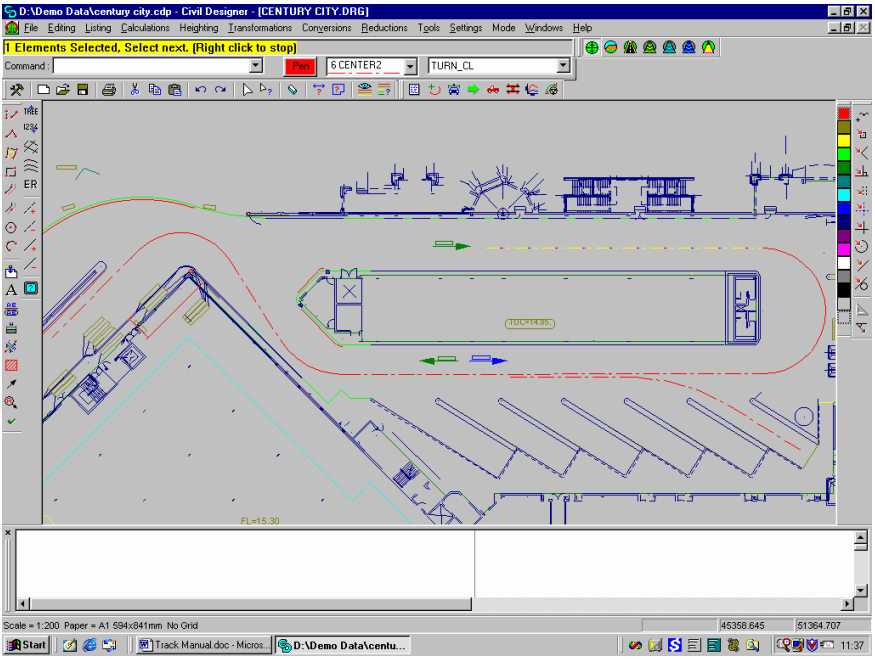


We are changing the Layer names because we will be running a Reverse simulation in a later exercise.

Define the track path

The track path is already drawn on the TrackTutor.drg drawing and is situated on the TURN_CL layer. There are two track paths on the drawing, a forward path (indicated by a green arrow) and a reverse path (indicated by a blue arrow).

Select the Turn ► Define Path ► Manual Tracking option from the Design Centre menu, or left click on the Define Path button on the Turn toolbar.



You will be prompted:

```
Select the road centre line one element at a
time
```

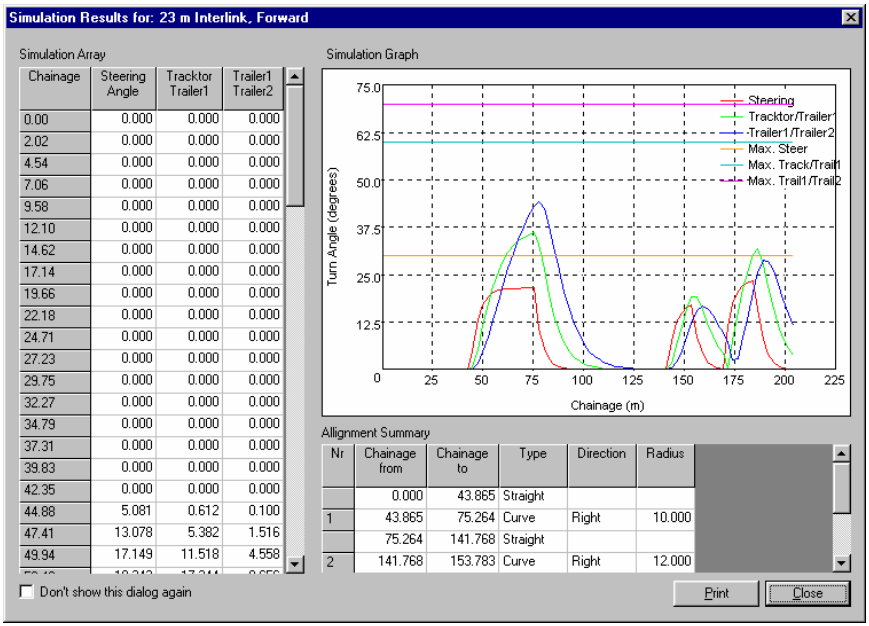
Start at the green arrow and click on each track path element. Right click to indicate the end of the path.

The program will now calculate coordinates at 0.5 m increments along the specified path. These coordinates will be kept in memory until you run Define Path again.

Run the Simulation

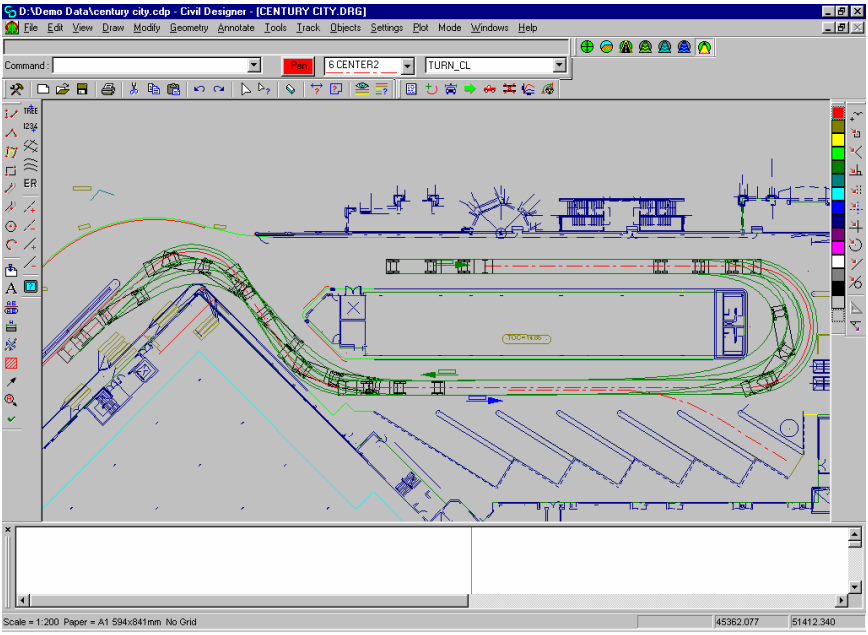
Select the Turn ► Run Simulation option from the Design Centre window, or press the Run Simulation icon on the Turn toolbar. The vehicle will move along the track path and leave behind the tracks of the vehicle's wheels.

The Simulation Results dialog will be displayed automatically.



You can use the graph to see exactly at which point any of the limiting angles (as specified in the Dimension dialog) were exceeded. Press the Print button to print the results.

Your drawing should now look like this.



The tracks generated by the simulation are poly-lines. You can therefore select and move them to fit within the curb lines.

Add a Vehicle Profile

A Vehicle profile is a drawing similar to that of the Vehicle dimension dialog.

Select the Turn ► Add Profile option or press the Add Profile button on the Turn toolbar.

You will be prompted:

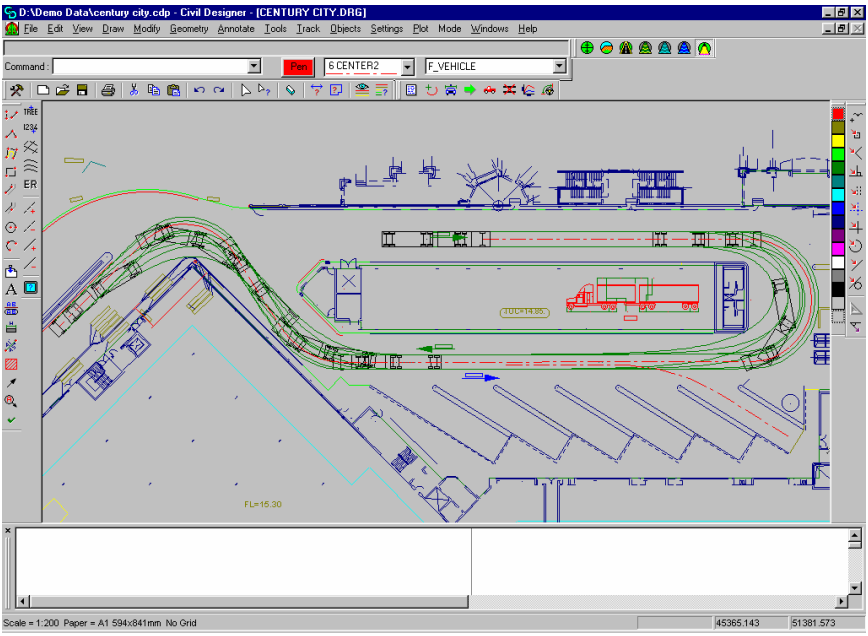
```
Indicate position for vehicle profile
```

Indicate a suitable position by left clicking on the drawing. At the prompt

```
Convert Attributes to Text during load
```

press YES. You will now be given the opportunity to move and rotate the profile.

Your drawing should now look like this:



Tutorial 3 – Run a Reverse simulation

In this tutorial we will use the vehicle file created in Tutorial 1 and run a forward simulation.

You will learn how to:

- Edit the Turn setup
- Define the track path
- Run the simulation

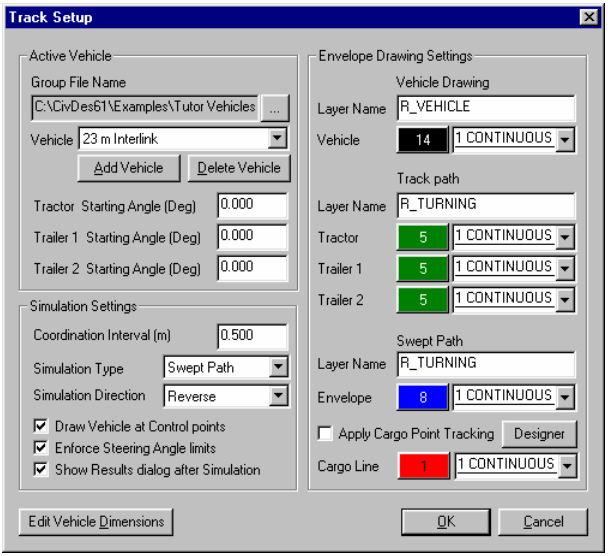
Edit the Turn Setup

Select the Turn ► Setup option or press the Setup button on the Turn toolbar. Make sure the "TutorVehicles.vcl" file is open and the active vehicle is the "23 m Interlink".

Change the *Coordination Interval* and *Simulation Type* settings to "0.5m" and "Swept Path" respectively. Change the *Simulation Direction* to "Reverse."

Check the *Draw Vehicles at control points* option to draw a vehicle diagram at every control point on your track path.

Change the rest of the dialog as follows:

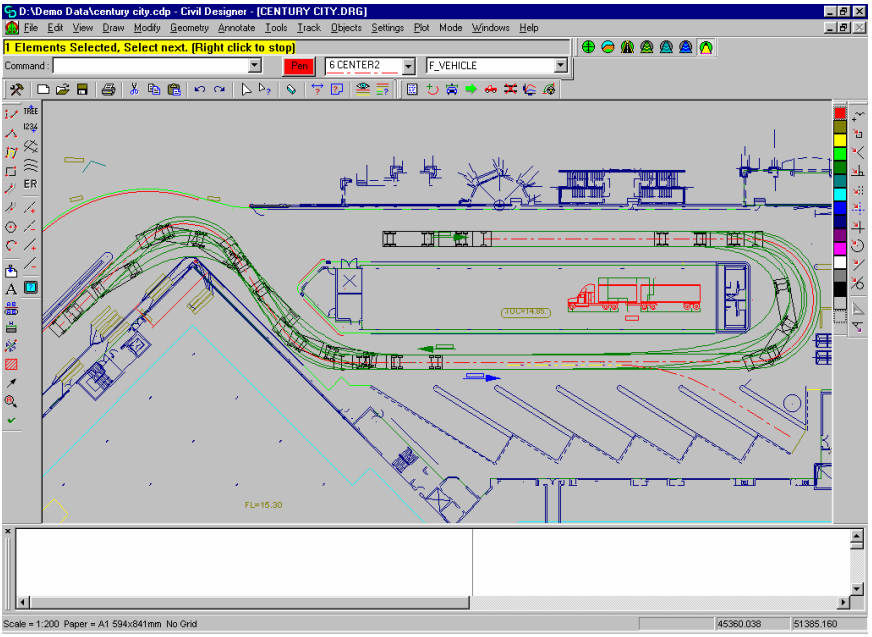


We are changing the Layer names because the program automatically deletes the specified layers in the [Envelope drawing settings] group, before running a new simulation.

Define the track path

The track path is already drawn on the TrackTutor.drg drawing and is situated on the TURN_CL layer. There are two track paths on the drawing, a forward path (indicated by a green arrow) and a reverse path (indicated by a blue arrow).

Select the Turn ► Define Path ► Manual Tracking option or left click on the Define Path button on the Turn toolbar.



The program will prompt:

```
Select the road centre line one element at a
time
```

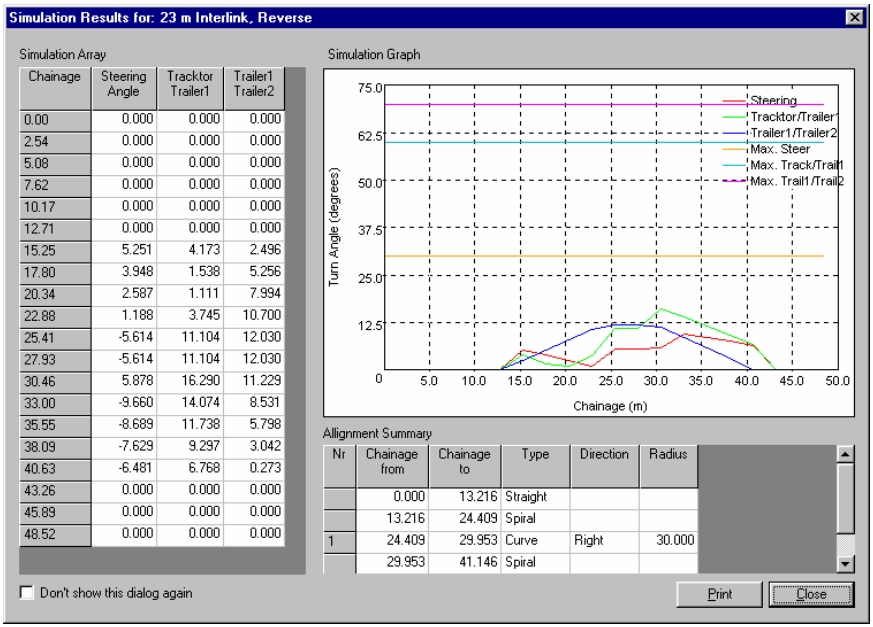
Start at the blue arrow and click on each track path element and right click to indicate the end of the path.

The program will now calculate coordinates at 0.5 m increments along the specified path. These coordinates will be kept in memory until you run Define Path again.

Run the Simulation

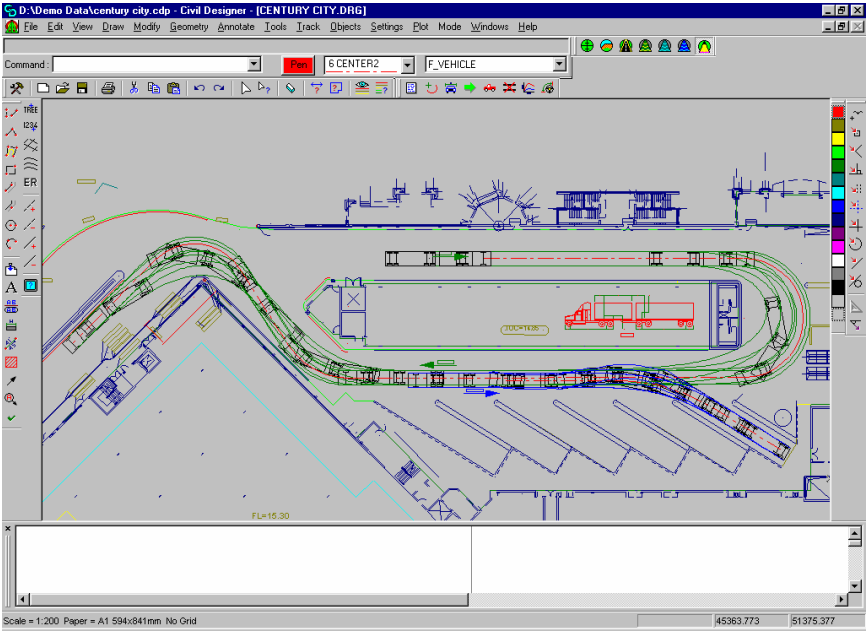
Select the Turn ► Run Simulation option or press the Run Simulation icon on the Turn toolbar. The vehicle will move along the track path and leave behind the area that the vehicle consumed.

The Simulation Results dialog will be displayed automatically.



You can use the graph to see exactly at which point any of the limiting angles (as specified in the Dimension dialog) were exceeded. Press the Print button to print the results.

Your drawing should now look like this.



The envelope generated by the simulation consists of poly-lines. You can therefore select and move the envelope to fit within the building lines.

Tutorial 4 – Cargo Tracking

This routine enables you to simulate a vehicle with a cargo that extends beyond the body of the vehicle. The cargo's limits can be specified and will be tracked when running the next simulation.

In this tutorial you will learn how to:

- Edit the Setup dialog.
- Specify the cargo limits.
- Turn the cargo limits.

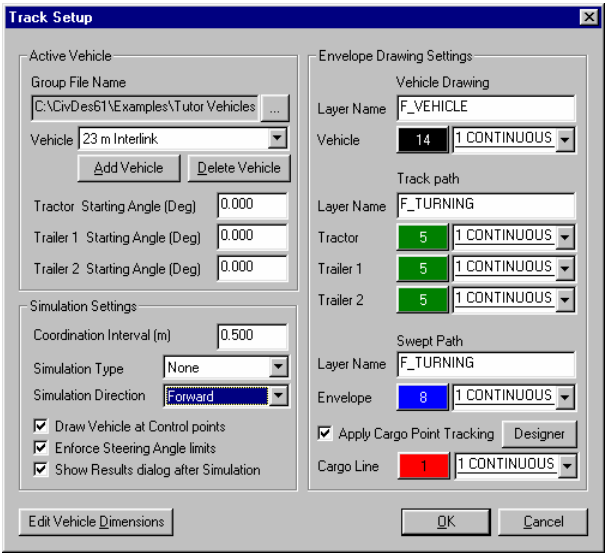
Edit the Setup dialog

Select the Turn ► Setup option or press the Setup button on the Turn toolbar. Make sure the "TutorVehicles.vcl" file is open and the active vehicle is the "23 m Interlink".

Check the *Apply Cargo point Tracking* check box in the Drawing Envelope Settings group.

Specify a pen colour for the Cargo Line.

Set the *Simulation Type* to "None" and the *Simulation Direction* to "Forward".



Cargo tracking can also be done in conjunction with any Simulation type (i.e. Track Path, or Swept Path).

Specify the cargo limits

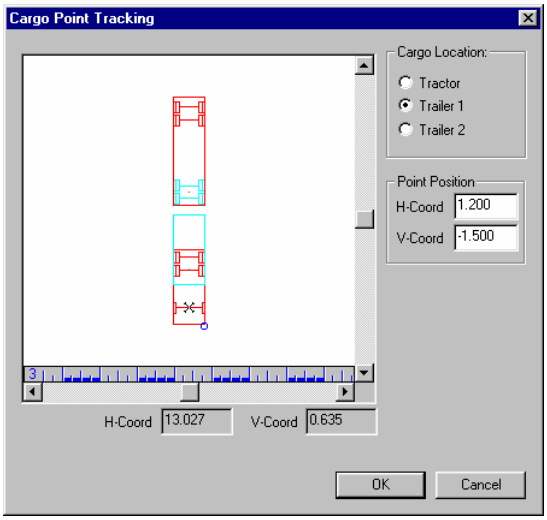
Press the *Designer* button on the Setup dialog to display the Cargo point Tracking dialog.

A diagram of the active vehicle will be drawn in the view area of the dialog. You can alter the view by magnifying [M], de-magnifying [D], panning [P], redrawing [R] or refreshing [S].

The cargo that we will simulate is situated on the first trailer, and extends 1.5 m beyond the front axle of the tractor.

Check the *Trailer 1* radio button in the Cargo Location group. The first trailer will be highlighted in a cyan pen.

Enter the H-Coord as "1.2", which indicates that the cargo is situated on the right hand side of the trailer. Enter the V-Coord as "–1.5", which means that the cargo is situated 1.5 m in front of the tractor's front axle.



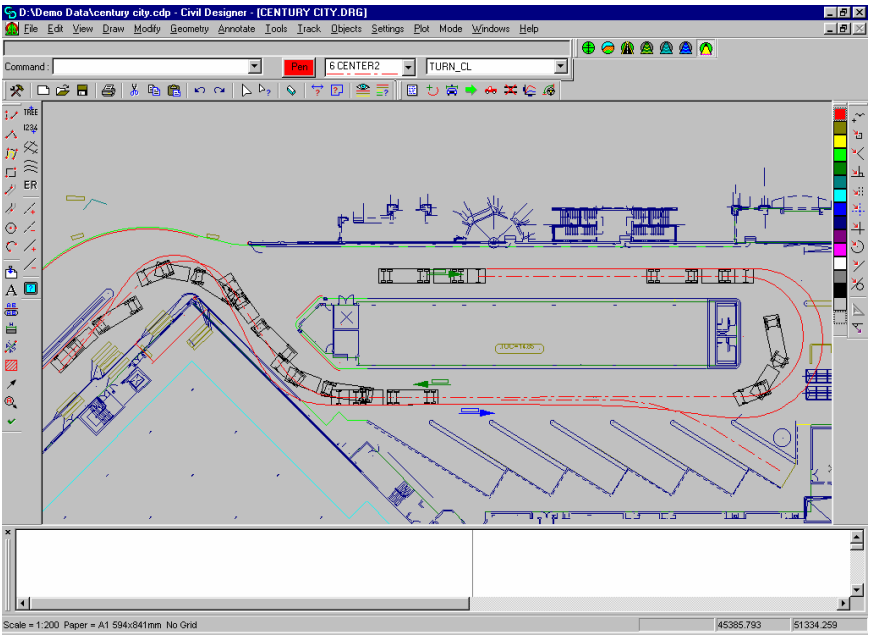
You can also indicate the cargo position by using your mouse as well as jumping to the nearest point using the "J" key. A blue circle indicates the cargo position.

Press OK to return to the Setup dialog.

Track the cargo limits

Define the correct track path as in Tutorial 2.

Select the Turn ► Run Simulation option or press the Run Simulation icon on the Turn toolbar.



The vehicle will move along the track path and leave behind a line, which represents the position of the defined cargo position along the path.

Tutorial 5 – Minimum Turning Circle

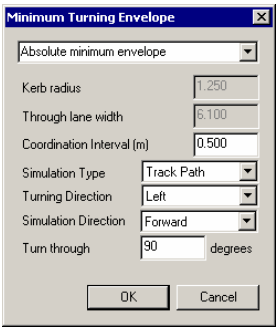
This function enables you to create a minimum turning circle envelope. The vehicle will move in a specified direction and then turn at its maximum steering angle.

In this tutorial you will learn:

- Edit the Minimum Turning Circle setup.
- Create a Minimum Turning Circle envelope.

Edit the Minimum Turning Circle Setup.

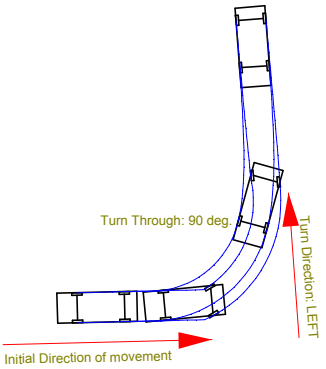
Select the Turn ► Minimum Envelope option or left click on the Minimum Envelope icon on the Turn toolbar. The Minimum Turning Envelope dialog will be displayed.

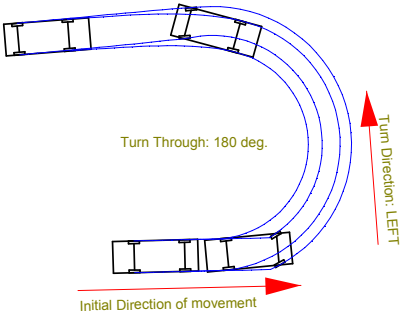


The *Coordination Interval* and *Simulation Type* options are exactly the same as in the main Setup dialog.

The *Simulation direction* option can be set to either "Forward" or "Single Unit Reverse". This means that you may create an envelope with the vehicle running forward, but it may only reverse if there are no trailers connected to it.

Refer to the following illustrations for the explanation of the Turning Direction and Turn Through options.





Press OK to close the Minimum Turning Envelope dialog.

The program will prompt:

```
Indicate Start point of minimum turning
circle envelope
```

Indicate the position where you want the vehicle to start the movement.

The program will then prompt

```
Indicate direction of initial movement
```

A line will be drawn from the indicated starting point to the current cursor position. Use this line to indicate the direction at which the vehicle must start moving.

The active vehicle will then move in the indicated direction and turn at its maximum steering angle in the specified direction, through the specified angle.

You can select and move the envelope and use it as a template.