



Munsys 14

ROADS USER MANUAL



Munsys® Roads User Manual

Munsys 14 © Copyright 2022 Open Spatial Pty Ltd. All rights reserved.

Open Spatial® makes no warranty, either expressed or implied, including but not limited to any implied warranties of merchantability or fitness for a particular purpose, regarding these materials and makes such materials available solely on an “as-is” basis.

In no event shall Open Spatial® be liable to anyone for special, collateral, incidental, or consequential damages in connection with or arising out of purchase or use of these materials. The sole and exclusive liability to Open Spatial®, regardless of the form of action, shall not exceed the purchase price of the materials described herein.

Open Spatial® reserves the right to revise and improve its products as it sees fit. This publication describes the state of this product at the time of its publication, and may not reflect the product at all times in the future.

No part of this book may be reproduced or copied by any graphic, electronic, or mechanical means without prior written permission of Open Spatial Corporation.

Third Party Trademarks

AutoCAD®, AutoCAD® Map 3D, AutoCAD® Civil 3D® and Autodesk MapGuide® are either registered trademarks or trademarks of Autodesk, Inc., in the USA and/or other countries.

Oracle® is a registered trademark of Oracle Corporation.

Microsoft®, Windows® and Microsoft® Notepad are registered trademarks of Microsoft Corporation in the USA and/or other countries.

ARC/INFO, ArcCad, and ArcView are registered trademarks of ESRI Corporation.

MIF/MID is a trademark of Pitney Bowes Incorporated.

All other brand names, product names or trademarks belong to their respective holders.

Visit Open Spatial on the internet: <http://www.openspatial.com>



Contents

Chapter 1 Introducing the Munsys Roads User Manual

Welcome to Munsys Roads	1
About the Munsys Roads User Manual	2
What's in this manual	2
Additional reading material	2
Conventions in this manual.....	3
Finding the information you need.....	3

Chapter 2 Getting acquainted with Munsys Roads

About Munsys Roads.....	4
Launching Munsys and Munsys Roads	5
Connecting to the Oracle database	5
The Munsys Roads interface.....	7
About road objects	12

Chapter 3 Querying road data from the database

Introduction.....	14
Querying all road objects.....	15
Querying road center lines by GSC	16
Querying road center lines by road name	17
Querying road intersection markers by GSC	18
Querying road intersection markers by road name	19
Querying road areas	20
Querying road edges	21
Querying walkways	22
Querying road intersection drawings.....	23
Querying road notes.....	24

Chapter 4 Creating road data

Introduction.....	25
Road capture settings	26
Capturing construction lines	28
Constructing road center lines	33
Road names and route numbers	39
Placing intersection markers.....	42
Placing endpoint intersection markers	42
Inserting nearest intersection markers	43
Capturing road areas	44

Capturing road edges	46
Capturing walkways	48
Placing road notes	50
Checking road integrity	51
Checking road object integrity	54
Checking road network integrity	55
Browsing integrity markers	56
Erasing integrity markers	57
Posting road data to the database	57
Validating object integrity and posting data at the same time	59
Road network quality reporting	60
Generating roads data status reports	62
Converting AutoCAD entities to road objects	63

Chapter 5 Maintaining road data

Modifying road data.....	65
Changing road objects	66
Moving an intersection marker	71
Editing road object attributes.....	72
Editing linked table attributes	75
Changing a road name	76
Changing a route number.....	77
Changing road width.....	78
Changing road classification.....	79
Changing road jurisdiction.....	80
Changing a road owner	81
Changing a road type	82
Changing road surface type	83
Changing a road edge type.....	84
Changing road notes	85
Adding comments	86
Deleting and undeleting road objects.....	87

Chapter 6 Creating road intersections

Introduction.....	88
Creating an intersection drawing	89
Drawing road intersection center lines	89
Rounding off road intersection center lines	89
Drawing road intersection edges	90
Drawing stop lines	91
Drawing pedestrian crossings	92
Constructing lanes	94
Setting channel lines	95
Setting dividing lines	96
Capturing islands	97
Capturing guard rails	97
Capturing traffic signals	99
Displaying traffic signal legends	101

Displaying typical detail	102
Placing electricity objects in an intersection drawing	103
Placing cables in an intersection drawing	105
Placing road markings in an intersection drawing	106
Placing warnings signs in an intersection drawing	107
Saving a new intersection drawing	109
Editing and saving an existing intersection drawing	110



Chapter 1

Introducing the Munsys Roads User Manual

Welcome to Munsys Roads

Munsys Roads is used to capture and maintain road networks. It is a user-friendly, easy to use geographic information management tool, which does not require GIS expertise to capture and manipulate data.

Munsys Roads forms part of the Munsys product range, which comprises the following applications:

- Munsys Cadastral
- Munsys Cable Route
- Munsys Cable Fiber
- Munsys Drainage
- Munsys Electricity
- *Munsys Roads*
- Munsys Sewer
- Munsys Water
- Munsys Map Books
- Munsys Spatial Data Manager
- Munsys Management Console
- Munsys Query
- Munsys Lineage
- Munsys Scheduled Tasks

About the Munsys Roads User Manual

The *Munsys Roads User Manual* enables users to easily find their way around Munsys Roads, and provides a conceptual overview of the functionality used in Munsys Roads. For the purpose of this manual, we assume that you are familiar with:

- the business rules of the application
- AutoCAD Map
- common GIS terminology

What's in this manual

The *Munsys Roads User Manual* consists of the following chapters:

- [Chapter 1 – Introducing the Munsys Roads User Manual](#), gives an overview of this manual, and provides links to additional reading material.
- [Chapter 2 – Getting acquainted with Munsys Roads](#), gives an overview of Munsys Roads and its various components.
- [Chapter 3 – Querying road data from the database](#), describes how to query road data from the database.
- [Chapter 4 – Creating road data](#), shows the user how to capture a road network, add additional road objects, and post road data to the database.
- [Chapter 5 – Maintaining road data](#), describes how to maintain existing road data.
- [Chapter 6 – Creating road intersections](#), shows the user how to create road intersection drawings.

Additional reading material

Before you start using this manual, we suggest that you first read the [Munsys Concepts User Manual](#), which contains the following information:

- the generic functionality of the various Munsys applications
- the generic query functionality that is used to query spatial data from the Oracle® database
- how to structure a query through query settings and GSC settings, and how to query data using the Munsys Query Palette
- how to view spatial data using the Munsys Info Palette
- how to work with Munsys Objects
- extras such as annotation, reporting and legend options.

Conventions in this manual

The following table lists the typographical conventions used in this manual.

Text element	Example
Keys you press on the keyboard	CTRL, ENTER, DEL
Screen buttons	Click Close.
Folder paths	C:\Program Files\Open Spatial
Menu paths	choose Query > Clear Basemap.
Hypertext links to more information	http://www.openspatial.com
Text displayed/typed on the command line	Munsys Roads
Dialog box/screen names	The Road Settings dialog box
Application functions	The Integrity Check function

Table 1 *Munsys typographical conventions*

Finding the information you need

To get help on

- general issues, select Help from the Munsys menu bar.
- an operation in progress, click the Help button on the dialog box.
- the latest support options, visit <http://www.openspatial.com>



Chapter 2

Getting acquainted with Munsys Roads

About Munsys Roads

Munsys Roads is used to capture and maintain road center lines, road intersections, road areas, road edges and walkways. Center lines and intersections are constructed relative to cadastral boundaries. Descriptive information is attached to road objects, as these objects are stored in the database.

The Munsys Roads toolbars enable fast and efficient capturing and maintaining of a road network. Munsys Roads has built-in rules to ensure that the road network data is maintained to engineering standards before it is posted to the database.

In Munsys Roads, the Intersection menu is used to design pedestrian crossings, islands, lanes, guard rails, traffic signals, road markings and warning signs. The design is saved as a drawing, which is referenced by an intersection marker.

With Munsys Roads, capturing road areas, road edges and walkways is simplified because road objects can be offset from cadastral boundaries. Attribute data can be attached to road objects to further simplify the query process. Road attribute data is captured by selecting values from lookup tables (a list of predefined values) to enforce data integrity.

Road objects can be queried easily from the database by street name or geographic location, or by a user-defined query, where an attribute condition can be specified for retrieving spatial data. Munsys Roads includes standard legends for map production, as well as traffic signal legends.

The integrity check procedure checks the road objects against the rules built into the modify and capture routines before data is posted to the database.

Launching Munsys and Munsys Roads

To launch Munsys, do one of the following:

- 1 Double-click the **Munsys Applications 14.2** icon on the Windows desktop.



- 2 Choose **Start > Programs > Open Spatial > Munsys 14.2 > Munsys Applications 14.2**

Connecting to the Oracle database

Munsys uses Oracle as its data store. The advantage of using the Oracle Spatial or locator technology is that spatial and attribute data are captured and managed in a single database. This reduces processing overheads and eliminates the complexity of coordinating and synchronizing different sets of data.

Important You have to be connected to the Oracle database before you can start working with Munsys Roads. If you try to launch any application without being connected to the database, you will be prompted to connect to the database first.

To connect to the Oracle database

- 1 Do one of the following:
 - Choose **File > Database > Connect...**
 - Click the **Connect to Database** button on the Munsys standard toolbar.The Connect to Database dialog box is displayed.

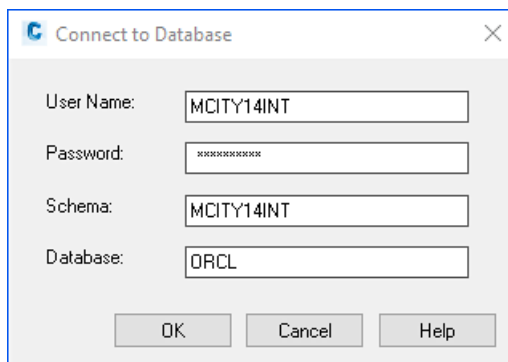


Figure 1 The Connect to Database dialog box

- 2 In the **User Name** field, enter your user name.
- 3 In the **Password** field, enter your password.
- 4 In the **Schema** field, enter the schema name.
- 5 In the **Database** field, enter the database name.
- 6 Click **OK**.

Note The database administrator will inform you which user name, password, schema name, and database name to use.

To launch Munsys Roads

When you launch Munsys for the first time, the configured base map automatically loads and the Munsys Roads functions are displayed on the menus and toolbars by default. Subsequently, the menus and toolbars of the application that you last worked with are displayed when you launch Munsys.

- 1 To launch Munsys Roads, do the following:
 - Choose **File > Munsys Applications**.
 - Click the **Munsys Applications** button on the Munsys standard toolbar.The Available Applications dialog box is displayed.

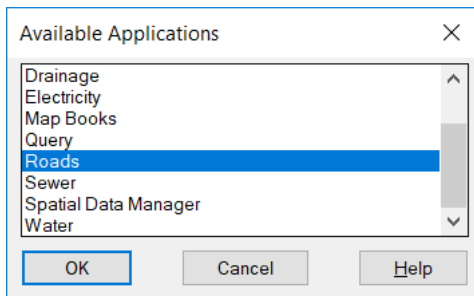


Figure 2 The Available Applications dialog box

- 2 From the list of available applications, select **Roads**, and then click OK.
The Munsys Roads menus and toolbars are loaded.

The Munsys Roads interface

The Munsys Roads interface consists of the following:

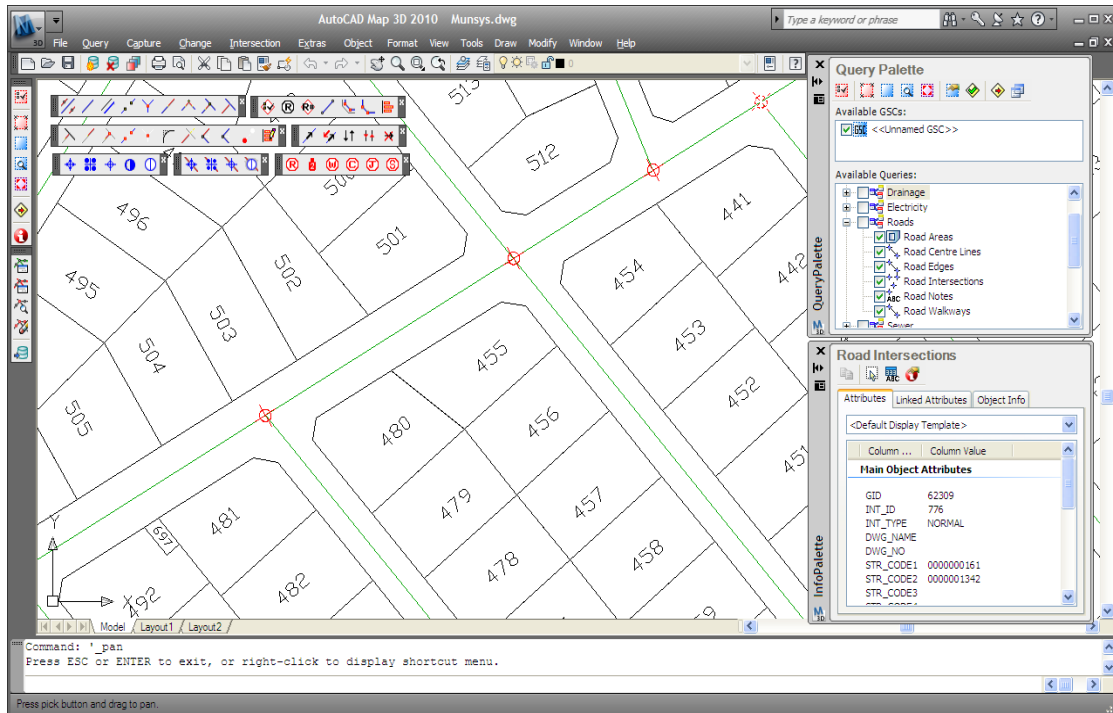


Figure 3 The Munsys Roads interface

Munsys menu bar – contains the Munsys and AutoCAD Map menus. Munsys menus are defined by a menu file, which automatically loads when the Munsys application is launched. AutoCAD Map menus are also defined by a menu file, which the user can customize.

Standard toolbar – contains frequently used AutoCAD Map buttons, standard Microsoft® buttons and Munsys buttons for connecting to the database and launching the various Munsys applications.

AutoCAD Map drawing area – this area is used to display Munsys data that is extracted from the database and AutoCAD Map drawings.

AutoCAD Map command line – displays prompts and messages.

AutoCAD Map status bar – displays information/drawing aids.

Munsys main toolbar – contains frequently used Munsys functions.

Munsys Integrity toolbar – contains the Integrity Check and Post to Database functions.






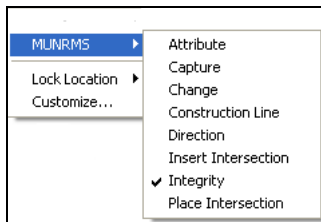
Use this button	When you want to...
	...validate road object integrity
	...validate road network integrity
	...browse integrity markers
	...erase integrity markers
	...post data to the database







Table 4 The Munsys Roads Integrity Toolbar

Munsys Roads toolbars – Munsys Roads has seven application-specific toolbars that are displayed when activated. To display the Roads toolbars, right-click in the grey area on the right-hand side of the Munsys Standard toolbar.



Point to MUNRMS, and then select the toolbars that you want displayed one by one. The toolbars are displayed in the drawing area.

- The Munsys Roads Construction Line toolbar contains the following buttons:

Use this button	When you want to...
	...construct a construction line.
	...draw a freehand construction line.
	...draw an offset construction line.
	...break a construction line.
	...change a construction line.
	...extend a construction line.




Use this button	When you want to...
	...fillet construction lines.
	...extend and break construction line.
	...trim a construction line.

Table 5 The Munsys Roads Construction Line toolbar

- The Munsys Roads Capture toolbar contains the following buttons:








Use this button	When you want to...
	...specify road capture settings.
	...add a new road name to the list.
	...add a new route number to the list.
	...draw a freehand road center line.
	...draw an offset road center line.
	...generate a road center line.
	...place a road note.

Table 6 The Munsys Roads Capture toolbar

- The Munsys Roads Direction toolbar contains the following buttons:






Use this button	When you want to...
	...show road center line direction.
	...change road center line direction.
	...show traffic direction.
	...change traffic direction.
	...clear direction arrows.

Table 7 The Munsys Roads Direction toolbar

- The Munsys Roads Place Intersection toolbar contains the following buttons:






Use this button	When you want to...
	...place an endpoint freeway intersection marker.
	...place an endpoint traffic light intersection marker.
	...place an endpoint normal intersection marker.
	...place an endpoint dead end intersection marker.
	...place an endpoint node intersection marker.

Table 8 *The Munsys Roads Place Intersection toolbar*

- The Munsys Roads Insert Intersection toolbar contains the following buttons:











Use this button	When you want to...
	...insert a nearest freeway intersection marker.
	...insert a nearest traffic light intersection marker.
	...insert a nearest normal intersection marker.
	...insert a nearest node intersection marker.

Table 9 *The Munsys Roads Insert Intersection toolbar*

- The Munsys Roads Change toolbar contains the following buttons:

Use this button	When you want to...
	...extend a road object to a boundary.
	...extend a road object by distance.
	...extend and break a road object.
	...break a road object.
	...change a road object.
	...fillet road objects.






Use this button	When you want to...
	...trim road objects.
	...add a vertex to a road object.
	...move a road object vertex.
	...move an intersection marker.
	...change a road note.

Table 10 The Munsys Roads Change toolbar

- The Munsys Roads Attribute toolbar contains the following buttons:







Use this button	When you want to...
	...change a road name.
	...change a route number.
	...change road width.
	...change road classification.
	...change road jurisdiction.
	...change road surface type.

Table 11 The Munsys Roads Attribute toolbar

In Munsys Roads, functions are activated by:

- typing the command on the command line
- activating the function from the menu bar
- clicking the appropriate button on the toolbar

About road objects

A road network consists of road center lines, intersections, road areas, road edges, traffic signals and walkways.

Road center lines

The construction of road center lines require construction lines to be captured as single lines in the road reserves. After construction lines have been cleaned, they are converted to road center lines. Attribute information such as road name, classification, route number, jurisdiction and surface type is attached to road center lines.

The traffic direction is set relative to the direction that the road center line has been captured in. With Munsys Roads, you can change the traffic direction as required.

Intersection Markers

Intersection markers are captured as one of the following:

- Normal – intersection of two or more road segments.
- Freeway – intersection of a freeway with a road, or another freeway.
- Dead End – indicates the end of a road.
- Traffic Light – traffic is controlled by traffic lights.
- Node – indicates that one part of the road ends and another continues, for example where the street name or road surface type changes.

Intersections

Intersections are designed and saved as an AutoCAD drawing that is referenced to the road intersection marker. All the traffic signs, markers and details may be customized to meet user requirements.

Road areas, road edges and walkways

With Munsys Roads, the capture process of these road objects is simplified, because the road objects can be offset from the cadastral boundary. Walkways are captured to serve as pedestrian pathways, which are tarred or paved. Road edges are captured as mountable, non-mountable or semi-mountable kerbs. The attribute information assigned to the road objects is stored in the database to further simplify the query process.



Figure 12 A road network



Chapter 3

Querying road data from the database

Introduction

This chapter describes how to query road data from the database using the Query menu. With Munsys Roads, you can either query all the road objects from the database, query road center lines or road intersection markers by road name or according to the current GSC, or query individual road objects (road areas, road edges, road walkways or intersection drawings).

You can also use the Munsys Query Palette to assist in retrieving road objects from the database. The Query Palette is also used to create custom (user-defined) queries. For more information about the Munsys Query Palette, refer to the *Munsys Concepts User Manual*.

Road data that is queried from the database includes the retrieval of spatial data, with a link to attribute data.

Querying all road objects

The Query All Road Objects function retrieves all the road objects according to the current GSC from all the road tables in the database. The queried objects are formatted according to their system query settings. Each object is queried onto its own layer. The Query All Road Objects function retrieves the following road objects from the database:

Road network object	Layer	Munsys object type
Road Center Line	RDCL	MunLine
Intersection Markers	RDINT	MunPoint
Walkway	RDWALK	MunLine
Road Area	RDAREA	MunPoly
Road Edge	RDEDGE	MunLine
Road Note	RDNOTE	MunLabel

To query all the road objects from the database, do the following:

- Choose **Query > All Road Objects**.

The road objects are displayed, and the command line indicates how many road objects respectively were retrieved from the database.



Figure 1 Querying all road objects

Querying road center lines by GSC

This query retrieves road center lines from the database according to the current GSC.

To query road center lines by GSC, do the following:

- Choose **Query > Road CLs > By GSC**.

The command line indicates how many road center lines were retrieved from the database according to the current GSC.



Figure 2 Query road center lines by GSC

Querying road center lines by road name

This query retrieves road center lines from the database according to a specified road name. The road name is selected from the Select Road Names dialog box.

To query road center lines by road name, do the following:

- 1 Choose **Query > Road CLs > By Road Name...**

The Select Road Name dialog box is displayed.

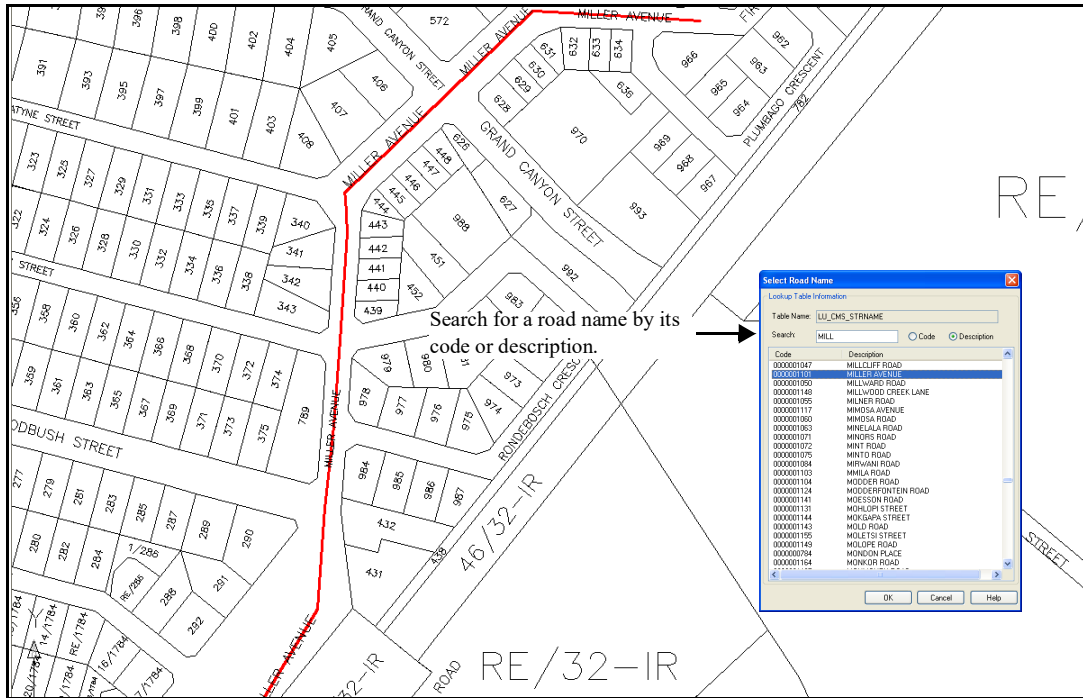


Figure 3 The Select Road Name dialog box

- 2 Select the appropriate road name from the list, and then click **OK**.

The command line indicates how many road center lines were retrieved from the database according to the specified road name.

Querying road intersection markers by GSC

This query retrieves all the road intersection markers from the database according to the current GSC.

To query road intersection markers by GSC, do the following:

- Choose **Query > Road Int Markers > By GSC**.

The command line indicates how many road intersection markers were retrieved from the database according to the current GSC.

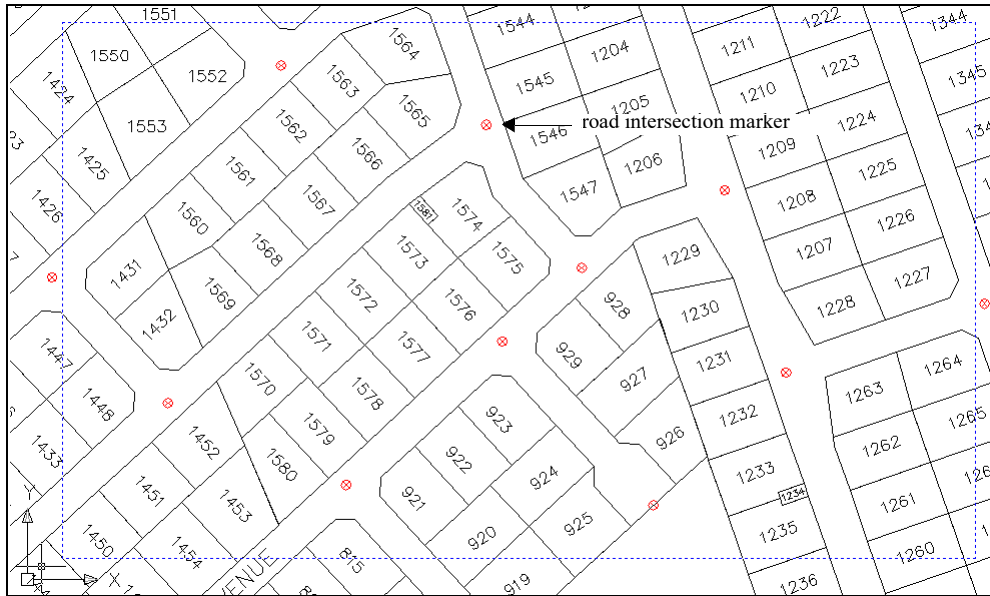


Figure 4 Query intersection markers by GSC

Querying road intersection markers by road name

This query retrieves road intersection markers from the database according to a specified road name. The road name is selected from the Select Road Names dialog box.

To query road intersection markers by road name, do the following:

- 1 Choose **Query > Road Int Markers > By Road Name...**

The Select Road Name dialog box is displayed.

Tip Use **Search** to easily locate a road name, either by code or description.

- 2 Select the appropriate road name from the list, and then click **OK**.

The command line indicates how many road intersection markers were retrieved from the database according to the specified road name.

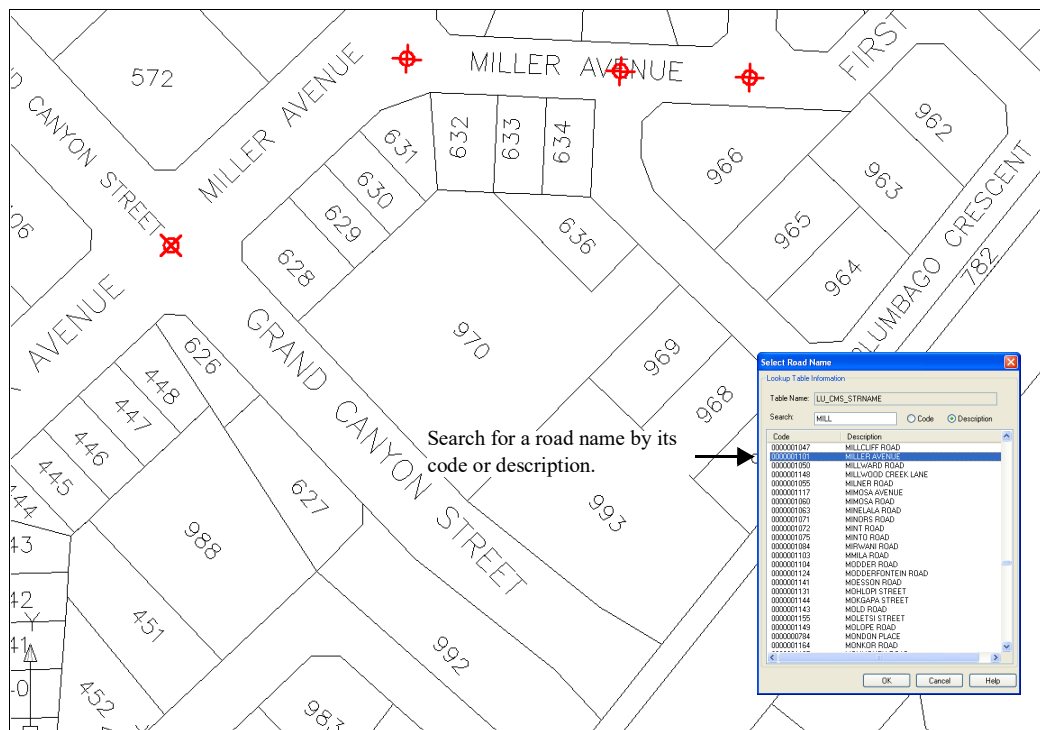


Figure 5 Query intersection markers by road name

Querying road areas

This query retrieves road areas from the database according to the current GSC.

To query road areas, do the following:

- Choose **Query > Road Objects > Road Areas**.

The command line indicates how many areas were retrieved from the database according to the current GSC.

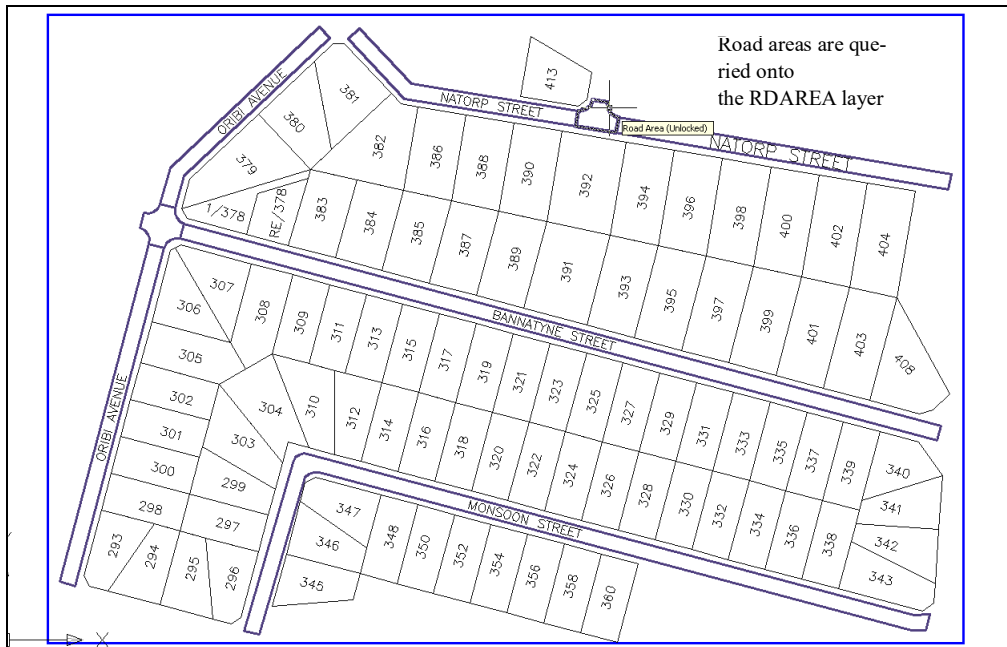


Figure 6 Query road areas

Querying road edges

This query retrieves road edges from the database according to the current GSC.

To query road edges, do the following:

- Choose **Query > Road Objects > Road Edges**.

The command line indicates how many road edges were retrieved from the database according to the current GSC.

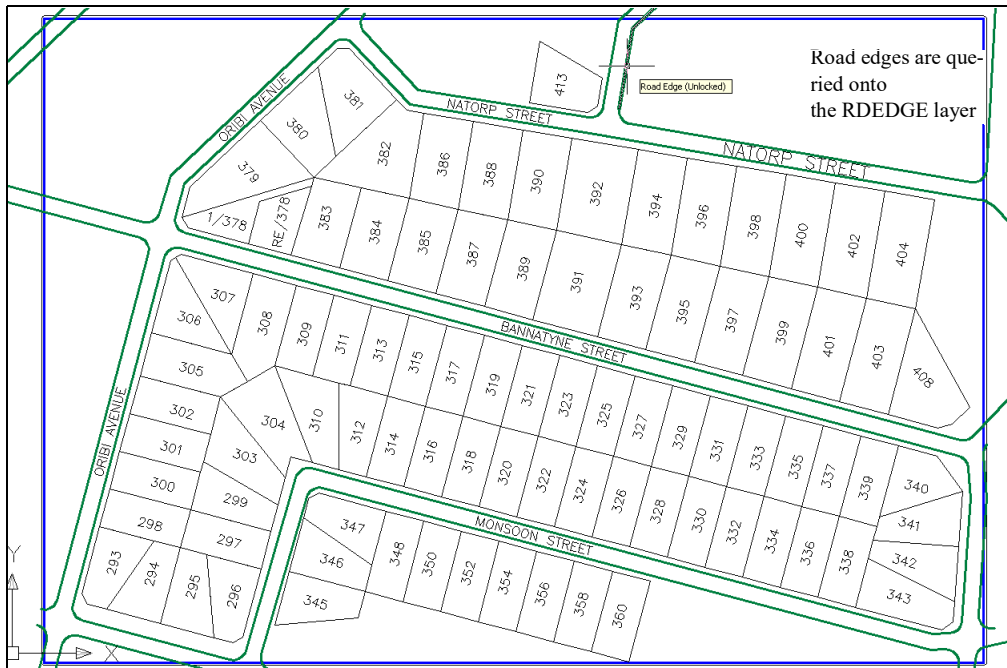


Figure 7 Query road edges

Querying walkways

This query retrieves all the walkways from the database according to the current GSC.

To query walkways, do the following:

- Choose **Query > Road Objects > Road Walkways**.

The command line indicates how many walkways were retrieved from the database according to the current GSC.

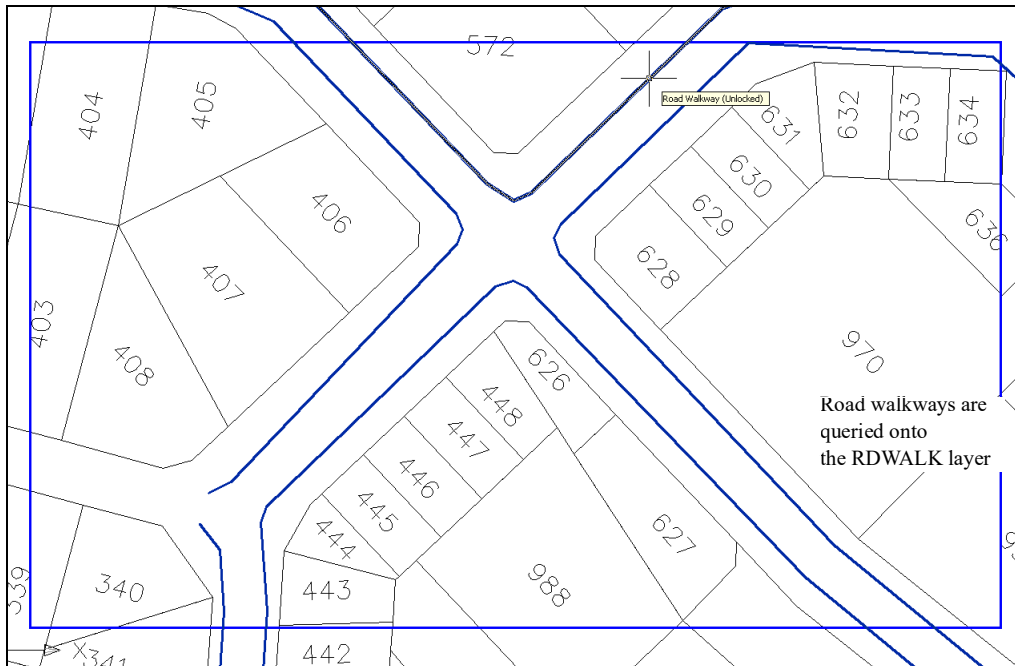


Figure 8 Query walkways

Querying road intersection drawings

With this query, you can retrieve a road intersection drawing from the database by selecting the related road intersection marker. Before you can query a road intersection drawing, you first have to query the intersection marker from the database.

To query road intersection drawings, do the following:

- 1 Choose **Query > Road Objects > Road Int Drawings**.
- 2 Select the appropriate intersection marker.

Munsys Roads retrieves the intersection drawing referenced by the selected intersection marker.

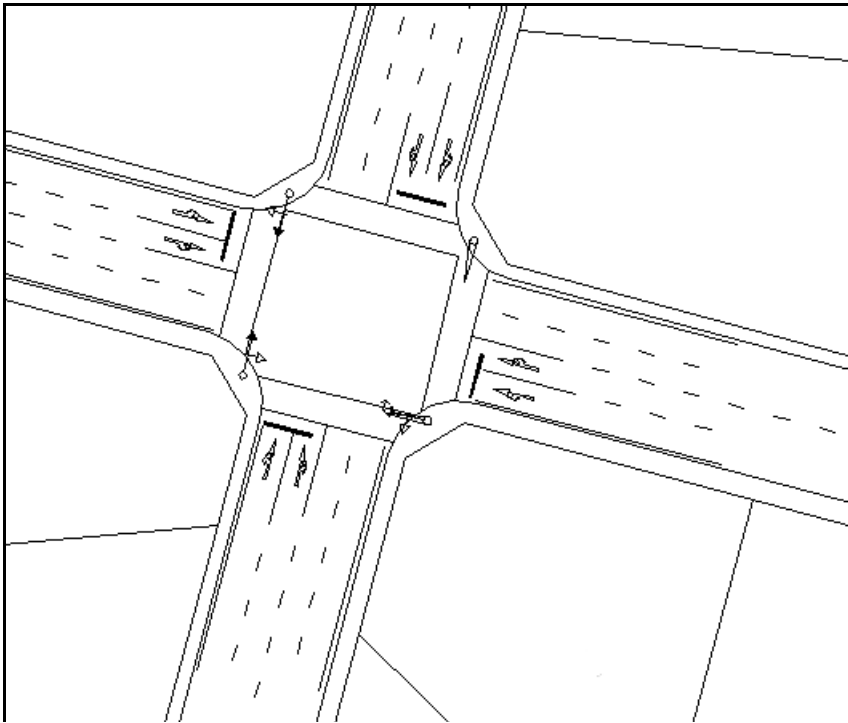


Figure 9 An intersection drawing

Querying road notes

This query retrieves all the road notes from the database according to the current GSC.

To query road notes, do the following:

- Choose **Query > Road Objects > Notes**.

The command line indicates how many road notes were retrieved from the database.

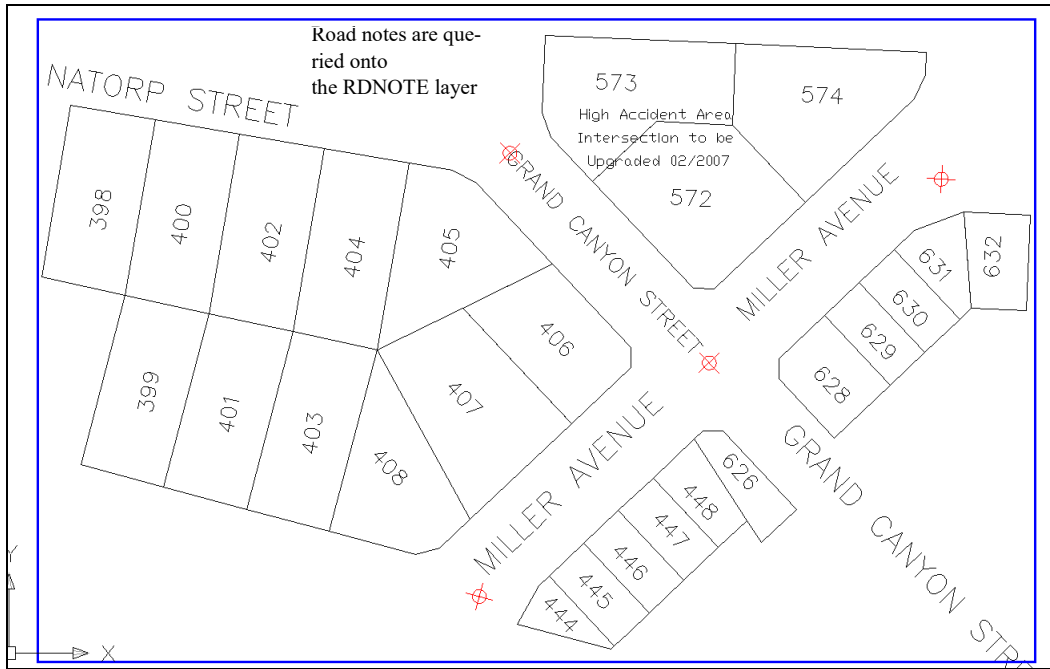


Figure 10 Query road notes



Chapter 4

Creating road data

Introduction

When you capture a road network, construction lines are captured first. These lines are constructed in the road reserves. Construction lines need to be cleaned after they have been captured. To be able to attach attribute data to construction lines, they have to be converted to road center lines. The attribute information includes the road name and route number.

Road center lines must be broken where they intersect with other road center lines, and a road name must be attached to the road center line. Setting the traffic direction is important for route analysis.

Intersection markers are captured as freeway, traffic light, normal, dead end, or node intersection markers.

Walkways, road areas and road edges are captured independently.

Road capture settings

Each Munsys application has its own default capture settings that are set by the GIS administrator in the Munsys Management Console.

In Munsys Roads, default settings are available for:

- file – the drawing directory
- general – construction color, include network in object integrity, database extents display resolution, integrity circle size, tag and symbol scale and rotation if coordinate transformation is done, snap tolerance, tag angle, font, height and justification
- integrity – road center line and intersection marker tolerance, road search tolerance, short objects
- intersection drawings – insertion scale, traffic symbol scale
- intersection markers – symbol scale
- notes – note height
- road center lines – classification, jurisdiction, offset distance, owner and type, surface type and traffic direction
- road edges – offset distance
- walkways – offset distance

You can change the current settings on the Roads Settings dialog box to speed up the capture process. Capture settings only apply to *new* road objects, and if you change the default settings, the changes are only valid for the current session.

Settings are changed by highlighting the current value, and then entering a new value, or by selecting the new value from a drop-down list.

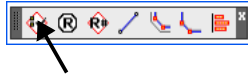
The user cannot change all of the settings. Some settings may only be changed by the GIS administrator to enforce consistency and integrity on a higher level.

Tip

A short description of a value is displayed when it is highlighted.

To specify road capture settings

- 1 Do one of the following:
 - Choose **Capture > Road Settings...**
 - Click the **Road Settings...** button on the Munsys Roads **Capture** toolbar.



- 2 The **Roads Settings** dialog box is displayed, showing the default road capture settings.

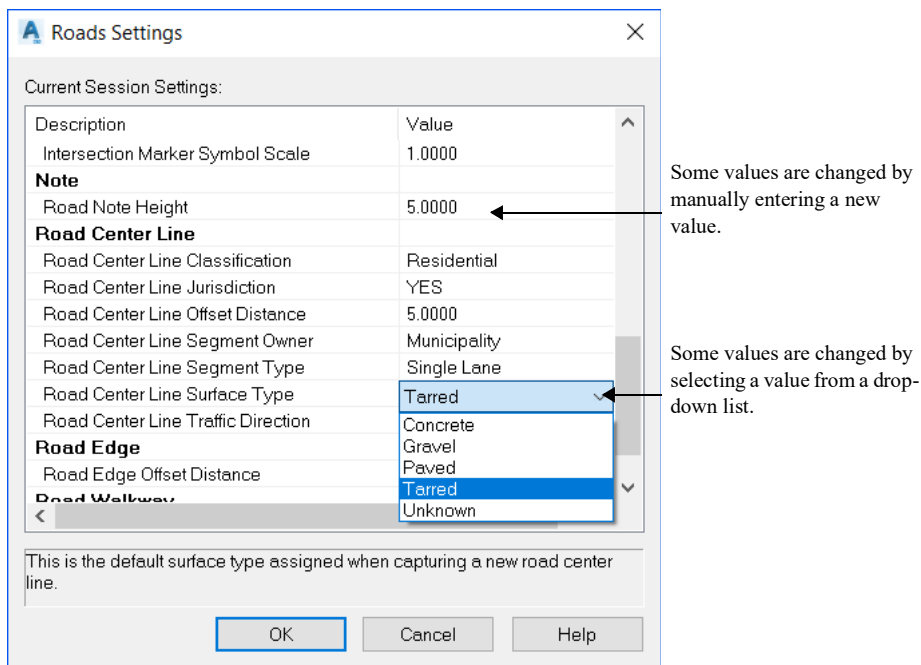


Figure 1 The Roads Settings dialog box

- 3 To change a value, do one of the following:
 - Highlight the current value, and then enter a new value.
 - Highlight the current value, and then choose the new value from the drop-down list.
- 4 Click **OK** to apply the new settings.

The settings will apply until you change them again, or until the current session is terminated, or until you switch to a different application.

Capturing construction lines

Construction lines are constructed in the road reserves, and they need to be cleaned after they have been captured. To be able to attach attribute data to construction lines, they have to be converted to road center lines. Construction lines can be constructed relative to the cadastral boundaries, drawn freehand, or drawn at a specified offset distance from objects such as parcel or municipality boundaries.



Figure 2 Construction lines

To construct a construction line

- 1 Do one of the following:
 - Choose **Capture > Construction Line > Construct**.
 - Click the **Construct Construction Line** button on the Munsys Roads **Construction Line** toolbar.



- 2 Specify an approximate start point for the construction line.
- 3 Specify an approximate endpoint for the construction line.
- 4 Select the first segment for offset.
- 5 Select the second segment for offset on the opposite side of the road reserve.

A construction line is constructed from the start point to the endpoint in the center of the segments indicated for offset.

To draw a freehand construction line

- 1 Do one of the following:
 - Choose **Capture > Construction Line > Draw Freehand**.
 - Click the **Draw Freehand Construction Line** button on the Munsys Roads **Construction Line** toolbar.

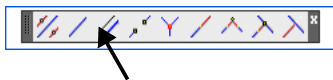


- 2 Specify the first point for the construction line.
- 3 Specify the next points for the construction line, and press **ENTER** when you have specified all the points.

The construction line is placed on the RDCL_LINES layer.

To draw an offset construction line

- 1 Do one of the following:
 - Choose **Capture > Construction Line > Draw Offset**.
 - Click the **Draw Offset Construction Line** button on the Munsys Roads **Construction Line** toolbar.

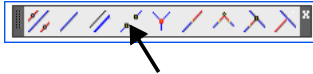


- 2 Specify a start point for the construction line within the road reserve.
- 3 Specify an endpoint for the construction line within the road reserve.
- 4 Specify a point on the side for offset.
- 5 On the command line, type the offset distance, or press **ENTER** to accept the default offset distance.

The construction line is placed on the RDCL_LINES layer.

To break a construction line

- 1 Do one of the following:
 - Choose **Capture > Construction Line > Break**.
 - Click the **Break Construction Line** button on the Munsys Roads **Construction Line** toolbar.



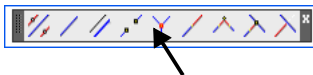
- 2 Select the construction line that you want to break.
- 3 Specify a break point on the construction line.
The construction line is broken at the break point that you specified.

Tip Do not use Object Snap.

To change a construction line

With this function, you can move the endpoint of a construction line to a new location.

- 1 Do one of the following:
 - Choose **Capture > Construction Line > Change**.
 - Click the **Change Construction Line** button on the Munsys Roads **Construction Line** toolbar.

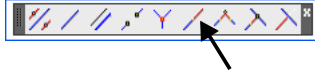


- 2 Select the construction line that you want to move.
- 3 Specify a new end point for the construction line.
The endpoint of the construction line is moved to the destination point that you specified.

To extend a construction line

With this function, you can extend a construction line to a boundary.

- 1 Do one of the following:
 - Choose **Capture > Construction Line > Extend**.
 - Click the **Extend Construction Line** button on the Munsys Roads **Construction Line** toolbar.



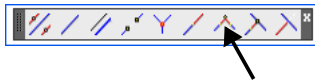
- 2 Select the boundary object to which you want to extend the construction line.
- 3 Select the construction line that you want to extend.

The construction line is extended to the boundary object that you selected.

To fillet construction lines

With this function, you can fillet two construction lines to a new intersection.

- 1 Do one of the following:
 - Choose **Capture > Construction Line > Fillet**.
 - Click the **Fillet Construction Line** button on the Munsys Roads **Construction Line** toolbar.



- 2 Select the first construction line.
- 3 Select the second construction line.

The construction lines are filleted into an intersection.

To extend and break construction lines

This function is used to extend one construction line to another construction line, which is then broken at the intersection. The construction line that you want to break must be able to intersect with the second construction line.

- 1 Do one of the following:
 - Choose **Capture > Construction Line > Extend and Break**.
 - Click the **Extend and Break Construction Line** button on the Munsys Roads **Construction Line** toolbar.

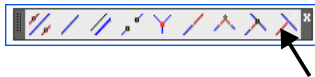


- 2 Select the construction line that you want to break.
 - 3 Select the construction line that you want to extend.
 - 4 Specify a break point on the first construction line.
- The construction lines are extended and broken as indicated.

To trim construction lines

With this function, you can trim a construction line by first selecting the cutting edge, and then selecting the section of the construction line that you want to remove. The cutting edge must be a line that intersects the construction line.

- 1 Do one of the following:
 - Choose **Capture > Construction Line > Trim**.
 - Click the **Trim Construction Line** button on the Munsys Roads **Construction Line** toolbar.



- 2 Select the construction line that you want to trim to.
 - 3 Select the side of a construction line that needs to be trimmed.
- The construction line is trimmed as indicated.

Constructing road center lines

The construction of road center lines requires construction lines to be captured first as single lines in the road reserves. After the construction lines are cleaned, they must be converted to road center lines. Road center lines can also be drawn freehand, or drawn at a specified offset distance from selected segments.

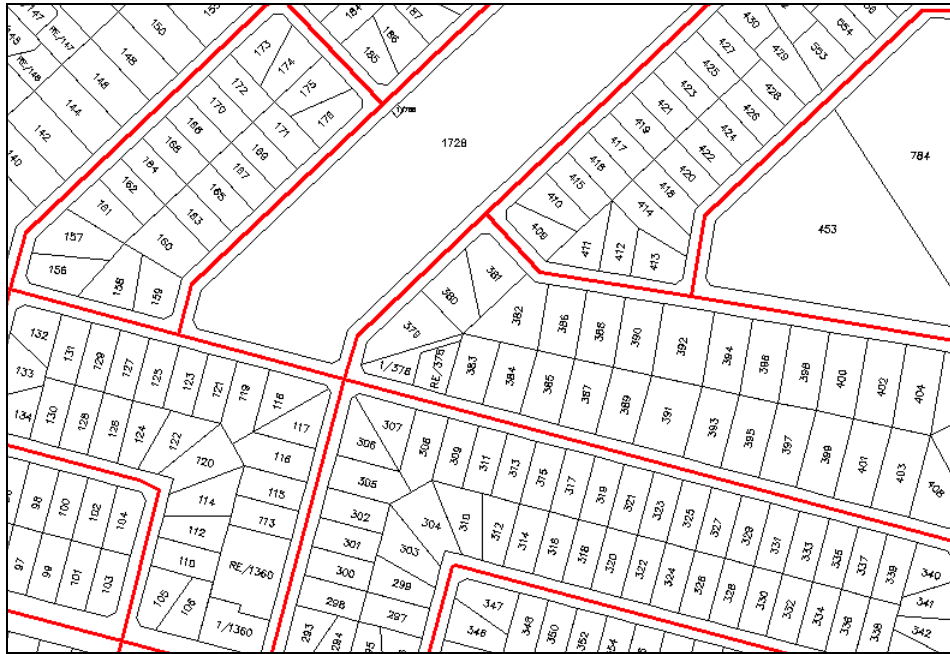
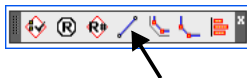


Figure 3 Road center lines

To draw a freehand road center line

Road center lines that do not follow a parcel boundary are drawn freehand by specifying consecutive points in the road reserve, or by entering coordinates on the command line. You can attach attribute information such as a road name and a route number to a road center line.

- 1 Do one of the following:
 - Choose **Capture > Road CL > Draw Freehand Road CL**.
 - Click the **Draw Freehand Road CL** button on the Munsys Roads **Capture** toolbar.



- 2 Specify the first point for the road center line, or enter coordinates on the command line.
- 3 Specify the next points for the road center line, or enter coordinates on the command line.
- 4 Press **ENTER** to complete.

A single road center line is created.

To draw an offset road center line

- 1 Do one of the following:

- Choose **Capture > Road CL > Draw Offset Road CL**.
- Click the **Draw Offset Road CL** button on the Munsys Roads **Capture** toolbar.



The command line prompts you to specify points, or to select a segment to offset the road center line from.

- 2 To draw the road center line by specifying points, do the following:
 - Specify the first point, and then specify next points for the road center line.
 - Press **ENTER** when you have specified all the points.
 - Specify a point on the side to offset the road center line.
 - On the command line, specify the offset distance, or press **ENTER** to accept the default offset distance.

The command line displays a message confirming that the road center line was created successfully.

- 3 To draw the road center line by specifying offset segments, do the following:
 - On the command line, type **O**, and then press **ENTER**.
 - Select a segment to offset the road center line from.
 - Specify a point on the side to offset the road center line.
 - On the command line, specify a multiplication factor for the default offset distance, or press **ENTER** to accept the default offset distance.
 - Continue selecting segments until all the segments have been selected, and then press **ENTER**.
 - Press **ENTER** to confirm that you have completed the segment selection.

The command line displays a message confirming that the road center line was created successfully.

To generate road center lines

With this function, road center lines are generated by selecting construction lines to join into a single road center line. You can attach attribute information such as a road name and a route number to a road center line.

- 1 To generate road center lines, do one of the following:
 - Choose **Capture > Road CL > Generate Road CL**.
 - Click the **Generate Road CL** button on the Munsys Roads **Capture** toolbar.



- 2 Select the construction lines to join as a road center line, and then press **ENTER**.
- 3 Press **ENTER** to confirm the selection.

A single road center line is constructed from the selected construction lines.

To show road center line direction

When you have captured and edited all the road center lines, you have to check the road center line direction to verify that it is correct. This can be done for both new and existing road center lines.

1 To show road center direction, do one of the following:

- Choose **Capture > Show Road CL Direction**.
- Click the **Show Road CL Direction** button on the Munsys Roads **Direction** toolbar.



2 Select the appropriate road center lines, and then press **ENTER**.

An arrow on each selected road center line indicates its direction.

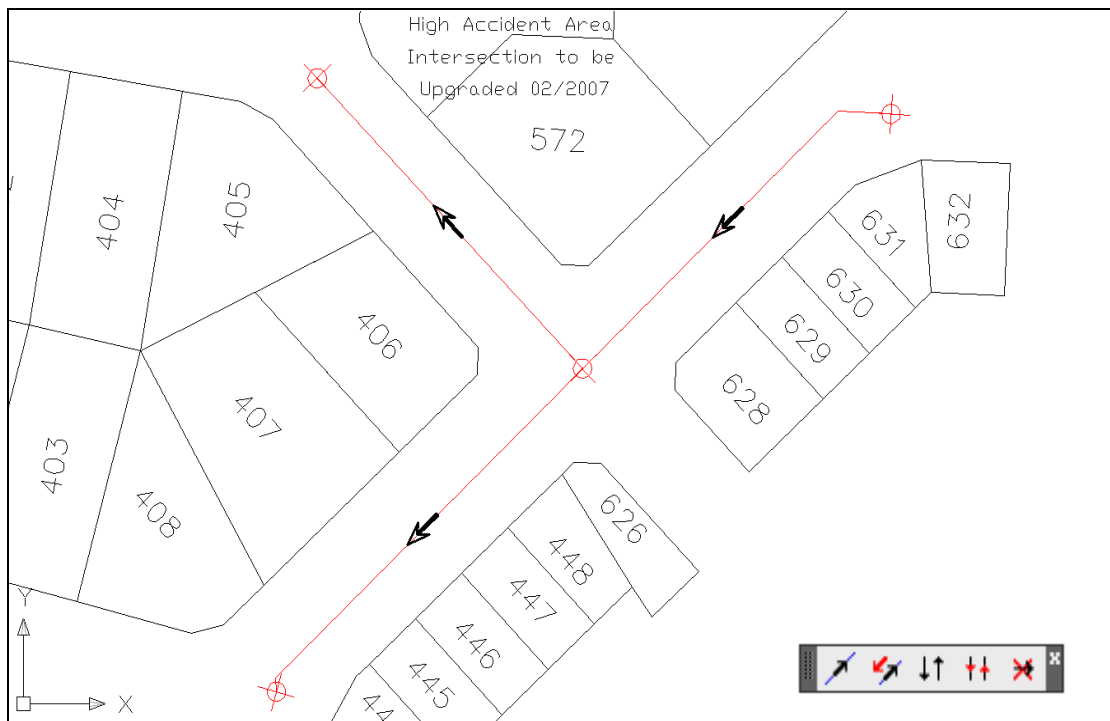
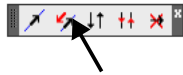


Figure 4 Road center line direction

To change road center line direction

This function is used to reverse road center line direction. If the direction of an existing road center line is changed, the center line is flagged as a change to be posted to the database.

- 1 To change road center line direction, do one of the following:
 - Choose **Capture > Change Road CL Direction**.
 - Click the **Change Road CL Direction** button on the Munsys Roads **Direction** toolbar.



- 2 Select the road center lines of which you want to change the direction, and then press **ENTER**.
The direction is reversed automatically.

To show traffic direction

With Munsys Roads, traffic direction is set relative to the direction that the road center lines have been captured in. With this function, you can show the current traffic direction of selected road center lines. The traffic direction could be any one of the following:

- bidirectional
- reverse
- forward

Tip You can set the default traffic direction in the **Road Settings** dialog box.

- 1 To show traffic direction, do one of the following:
 - Choose **Capture > Show Traffic Direction**.
 - Click the **Show Traffic Direction** button on the Munsys Roads **Direction** toolbar.



- 2 Select the appropriate road center line(s).
An arrow on each selected road center line indicates its current direction.

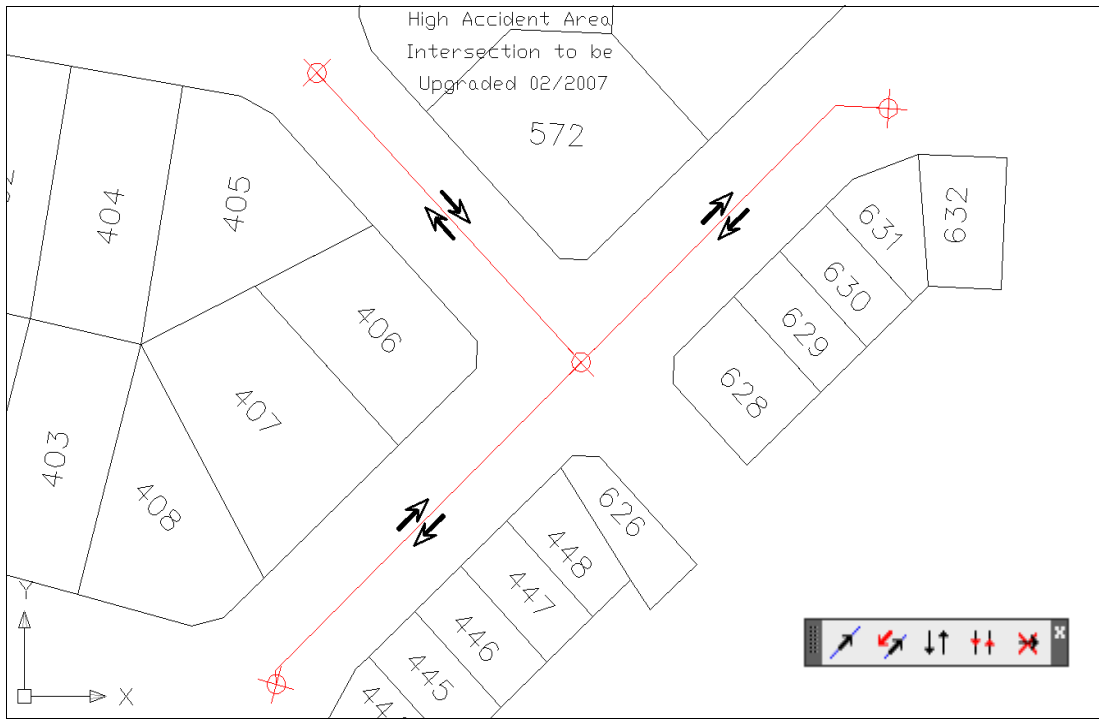


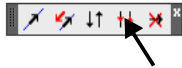
Figure 5 Traffic direction

To change traffic direction

With Munsys Roads, traffic direction is set relative to the direction that a road center line has been captured in. With this function, traffic direction of a road center line can be changed as required.

To change traffic direction, do the following:

- 1 To change traffic direction, do one of the following:
 - Choose **Capture > Change Traffic Direction**.
 - Click the **Change Traffic Direction** button on the Munsys Roads **Direction** toolbar.

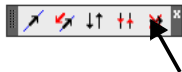


- 2 Select the road center line/s of which you want to change the direction, and then press **ENTER**.
The command line displays the different traffic direction options.
- 3 To change the traffic direction, do one of the following:
 - Press **ENTER** accept the default value.
 - Enter the first character of the option you choose, and then press **ENTER**.

To clear direction arrows

This function removes direction arrows that were displayed in order to show road center line or traffic direction.

- 1 Do one of the following:
 - Choose **Capture > Clear Direction Arrows**.
 - Click the **Clear Direction Arrows** button on the Munsys Roads **Direction** toolbar.



The direction arrows are cleared from the drawing.

Road names and route numbers

Road names and route numbers are attached to center lines from a list of available names/numbers, eliminating errors such as misspelled names or wrong numbers.

To add a new road name to the list

With this function, you can add a new road name to the list of available road names.

- 1 Do one of the following:
 - Choose **Capture > Road CL > Add New Road Name to List...**
 - Click the **Add New Road Name to List...** button on the Munsys Roads **Capture** toolbar.



The Create New Road Name dialog box is displayed.

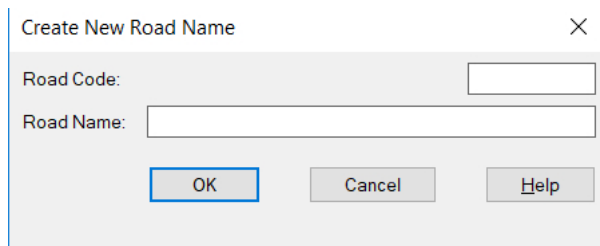
A screenshot of the 'Create New Road Name' dialog box. The dialog box has a title bar with the text 'Create New Road Name' and a close button (X). Below the title bar, there are two input fields: 'Road Code:' and 'Road Name:'. Below the input fields, there are three buttons: 'OK', 'Cancel', and 'Help'.

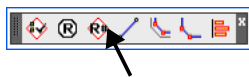
Figure 6 The Create New Road Name dialog box

- 2 Enter a new road code and road name, and then click **OK**.
The new road is added to the list of available road names.

To add a new route number to the list

With this function, you can add a new route number to the list of available route numbers.

- 1 Do one of the following:
 - Choose **Capture > Road CL > Add New Route Number to List...**
 - Click the **Add New Route Number to List...** button on the Munsys Roads **Capture** toolbar.



The Create New Route Number dialog box is displayed.

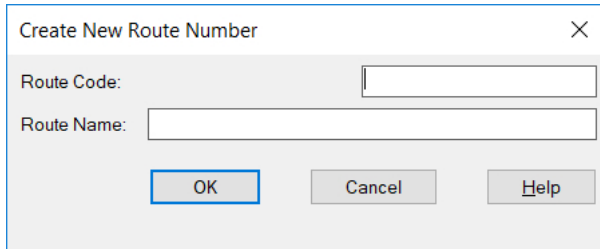


Figure 7 The Create New Route Number dialog box

- 1 Enter a new route code and route name, and then click **OK**.

The new route number is added to the list of available route numbers.

To attach a road name to road center lines

With this function, you can attach a road name to selected road center lines. The road name is selected from a list of available names.

- 1 Choose **Capture > Attach Road Name...**
- 2 Select the road center lines to which you want to attach a road name, and then press **ENTER**.

The Select Road Name dialog box is displayed.

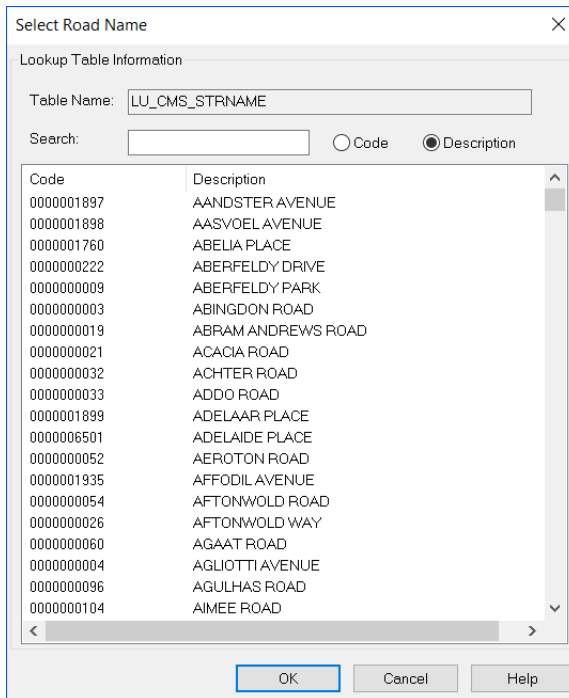


Figure 8 The Select Road Name dialog box

- 3 Select a road name from the list, and then click **OK**.

The road name is attached to road center lines that you selected.

Tip You can search for a specific road name by its code or description.

To attach a route number to road center lines

With this function, you can attach a route number to selected road center lines. The route number is selected from a list to ensure data accuracy.

- 1 Choose **Capture > Attach Route Number...**
- 2 Select the road center lines to which you want to attach a route number, and then press **ENTER**.
The Select Route Number dialog box is displayed.

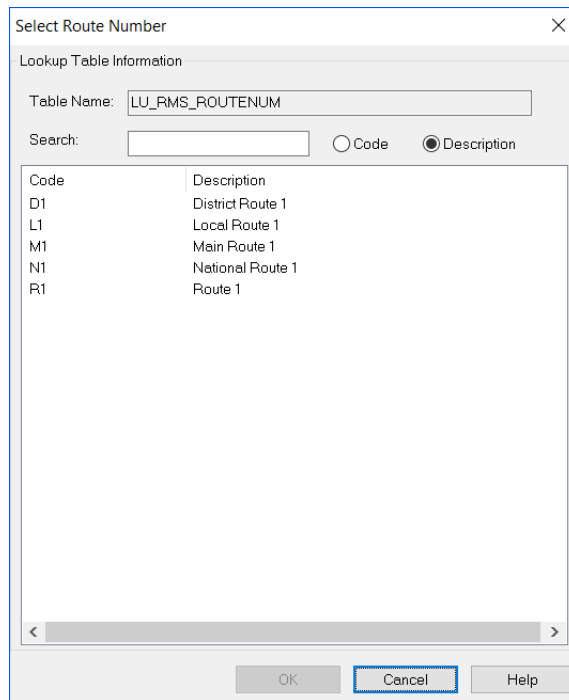


Figure 9 The Select Route Number dialog box

- 3 Select a route number from the list, and then click **OK**.
The route number is attached to road center lines that you selected.

Tip You can search for a specific route number by its code or description.

Placing intersection markers

A road intersection marker references an intersection drawing that contains all the road and traffic signs for that intersection. Before you can create an intersection drawing, you first have to capture an intersection marker. With Munsys Roads, you can capture the following intersection markers:






Intersection marker	Symbol	Description
Freeway		Traffic flow is not controlled by a traffic controller system. Traffic flows freely and is controlled by road lanes joining or separating traffic flow, for example a highway or motorway.
Traffic light		Traffic is controlled by traffic lights.
Normal		Traffic is controlled by warning signs and road markings.
Dead end		Indicates that the road ends at this point and does not continue in any direction.
Node		Indicates that one part of the road ends and another continues, for example where the street name or road surface type changes.

Table 10 Intersection markers

Intersection markers are placed on the RDINT layer, to be verified when the integrity check is run.

Placing endpoint intersection markers

With this function, you can place endpoint intersection markers at the endpoint of a selected road center line.

To place endpoint intersection markers

- Do one of the following:
 - Choose **Capture > Place Endpoint Int Marker > Marker Name**.
 - Click the appropriate button on the Munsys Roads **Place Intersection** toolbar.



- Select a point close to the endpoint on the center line where you want to place the intersection marker.

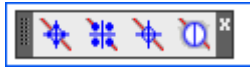
The intersection marker is placed at the endpoint of the selected road center line.

Inserting nearest intersection markers

With this function, you can insert a road intersection marker at a nearest selected point on a road center line. The underlying center line is broken at the insertion point.

To insert nearest intersection markers

- 1 Do one of the following:
 - Choose **Capture > Insert Nearest Int Marker > Marker Name**.
 - Click the appropriate button on the Munsys Roads **Insert Intersection** toolbar.



- 2 Select a point on the road center line where you want to insert the intersection marker.
The intersection marker is placed at the point you selected, and the underlying center line is broken.

Capturing road areas

Road areas can be created by indicating consecutive points along the cadastral boundaries to create a road area polygon, or by drawing a road area boundary, and then generating a polygon from the boundary lines. Road areas have to be checked against the business rules before they can be posted to the database.

To draw a road area polygon

With this function, you can draw a road area polygon by indicating consecutive points in the drawing. The polygon is closed automatically and constructed as a MunPoly object, to be verified when the integrity check is run.

- 1 Choose **Capture > Road Area > Draw Road Area Polygon**.
- 2 Specify the first polygon point.
- 3 Specify the next polygon points, and then press **ENTER**.

Munsys closes the road area polygon automatically by snapping to the first specified point.

To draw a road area boundary

With this function, you can create a road area boundary by indicating consecutive points along the cadastral boundaries. Munsys closes the road area boundary automatically by snapping to the first specified point. You can then generate a road area polygon from the road area boundary lines.

- 1 Choose **Capture > Road Area > Draw Road Area Boundary**.
- 2 Indicate the first point for the road area.
- 3 Indicate the next points, and then press **ENTER**.
- 4 Press **ENTER** to close the polygon.

To generate a road area polygon

This function is used to generate a polygon from a road area boundary.

- 1 Choose **Capture > Road Area > Generate Road Area Polygons**.
- 2 Select all the lines on the appropriate road area, and then press **ENTER**.
- 3 Select a point within the boundary of the road area, and then press **ENTER**.

Munsys creates a road area polygon from the road area boundary lines that you selected.

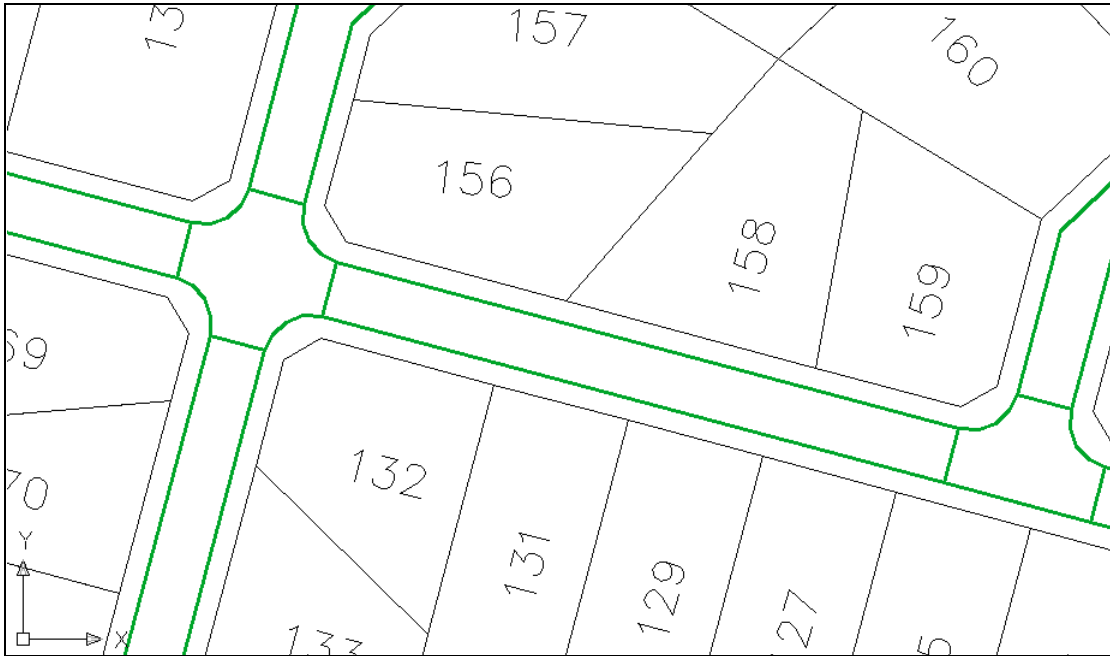


Figure 11 Road areas

Capturing road edges

Road edges are captured as mountable, non-mountable or semi-mountable kerbs. Road edges are placed on the RDEDGE layer, and they have to be checked against the business rules before they can be posted to the database.

To draw an offset road edge

1 Choose **Capture > Road Edge > Draw Offset Road Edge**.

The command line prompts you to specify points, or to select a segment to offset the road edge from.

2 To draw the road edge by specifying points, do the following:

- Specify the first point, and then specify next points for the road edge.
- Press **ENTER** when you have specified all the points.
- Specify a point on the side to offset the road edge.
- On the command line, specify the offset distance, or press **ENTER** to accept the default offset distance.

The command line displays a message confirming that the road edge was created successfully.

3 To draw the road edge by specifying offset segments, do the following:

- On the command line, type **O**, and then press **ENTER**.
- Select a segment to offset the road edge from.
- Specify a point on the side to offset the road edge.
- On the command line, specify a multiplication factor for the default offset distance, or press **ENTER** to accept the default offset distance.
- Continue selecting segments until all the segments have been selected, and then press **ENTER**.
- Press **ENTER** to confirm that you have completed the segment selection.

The command line displays a message confirming that the road edge was created successfully.

To draw a freehand road edge

- 1 Choose **Capture > Road Edge > Draw Freehand Road Edge**.
- 2 Specify the first point for the road edge.
- 3 Specify the next points for the road edge, and press **ENTER** when you have specified all the points.

The command line displays a message confirming that the road edge was created successfully.

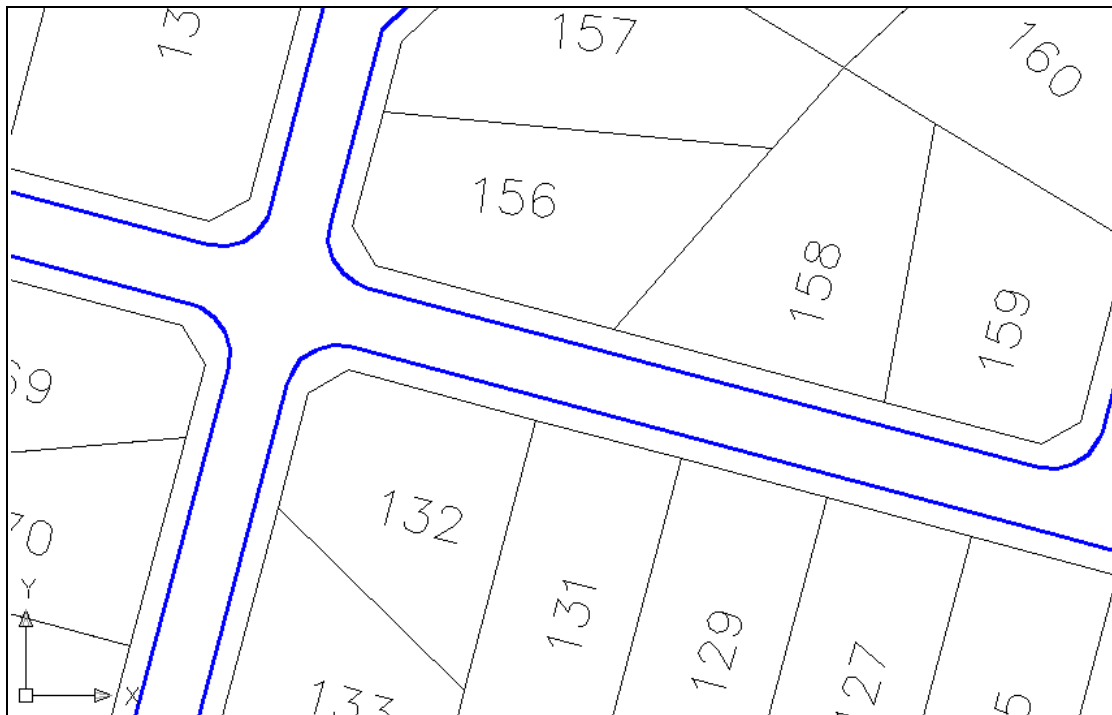


Figure 12 Road edges

Capturing walkways

Walkways are captured to serve as pedestrian pathways, which are tarred or paved. Walkways are placed on the RDWALK layer, and have to be checked against the business rules before they can be posted to the database.

To construct a walkway

- 1 Choose **Capture > Road Walkway > Construct Walkway**.
 - 2 Specify an approximate start point for the walkway.
 - 3 Specify an approximate endpoint for the walkway.
 - 4 Select the first line for offset from a boundary.
 - 5 Select the second line for offset from another boundary on the opposite side of the road reserve.
- A single walkway is placed between the two boundary lines.

To draw an offset walkway

- 1 Choose **Capture > Road Walkway > Draw Offset Walkway**.
The command line prompts you to specify points, or to select a segment to offset the walkway from.
- 2 To draw the walkway by specifying points, do the following:
 - Specify the first point, and then specify next points for the walkway.
 - Press **ENTER** when you have specified all the points.
 - Specify a point on the side to offset the walkway.
 - On the command line, specify the offset distance, or press **ENTER** to accept the default offset distance.

The command line displays a message confirming that the walkway was created successfully.
- 3 To draw the walkway by specifying offset segments, do the following:
 - On the command line, type **O**, and then press **ENTER**.
 - Select a segment to offset the walkway from.
 - Specify a point on the side to offset the walkway.
 - On the command line, specify a multiplication factor for the default offset distance, or press **ENTER** to accept the default offset distance.
 - Continue selecting segments until all the segments have been selected, and then press **ENTER**.
 - Press **ENTER** to confirm that you have completed the segment selection.

The command line displays a message confirming that the walkway was created successfully.

To draw a freehand walkway

- 1 Choose **Capture > Road Walkway > Draw Freehand Walkway**.
- 2 Specify a start point for the walkway, or enter coordinates on the command line.
- 3 Specify the next points for the walkway, or enter coordinates on the command line.
- 4 Press **ENTER** to complete.

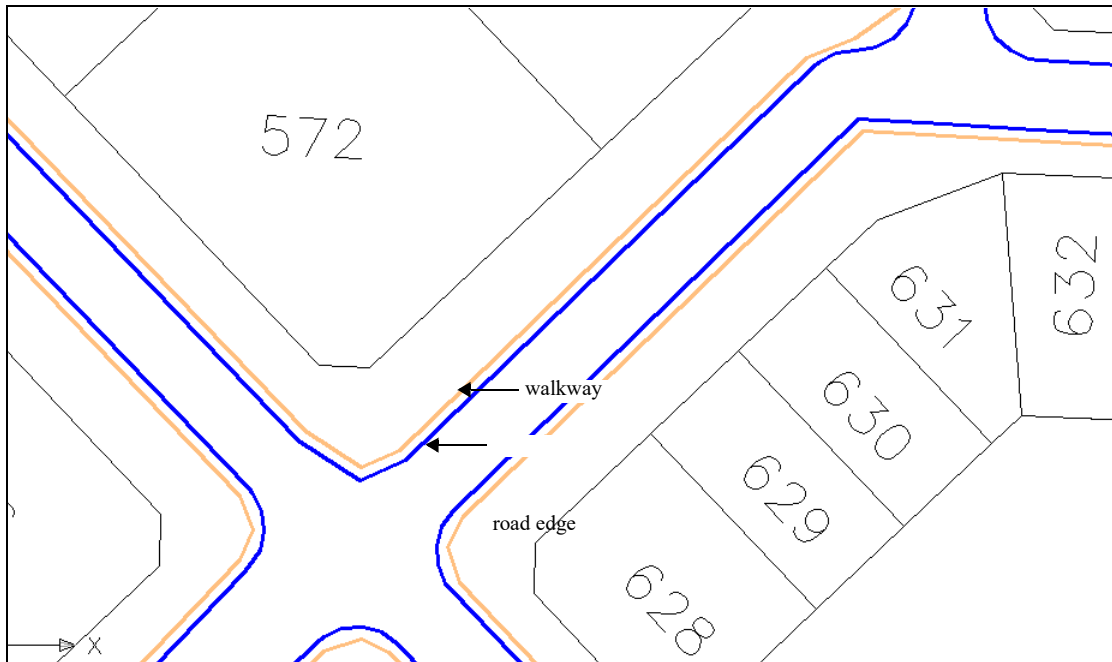


Figure 13 Road walkways

Placing road notes

For map production purposes, information about a spatial object is added in the form of a note. Road notes are placed on the RDNOTE layer, to be verified when the integrity check is run.

To place a road note

- 1 Do one of the following:
 - Choose **Capture > Place Road Note**.
 - Click the **Place Road Note** button on the Munsys Roads **Capture** toolbar.



- 2 Specify the insertion point for the note.
- 3 On the command line, specify the note height, or press **ENTER** to accept the default note height.
- 4 To indicate the note angle, do one of the following:
 - Indicate the angle with your mouse.
 - On the command line, type **A** to align the note to an object, press **ENTER**, and then select the object to which you want to align the note.
- 5 Type the note value on the command line, and then press **ENTER**.
The note is inserted as specified.

Checking road integrity

The Integrity Check provides a set of rules to validate spatial objects. All new or modified spatial objects have to be verified against integrity rules built into the capture and change routines of every application before they can be posted to the database. New and changed objects contain an internal status that requires the validation process.

The Integrity Check is run from the Capture menu, or by clicking the appropriate button on the Integrity toolbar. The way in which the integrity check is executed depends on the preferences/options specified in the Munsys Options dialog box. The various options available on this dialog box are discussed in detail in the Munsys Concepts User Manual: Chapter 5: Munsys Options.

The integrity check is split into two separate functions to facilitate flexibility and ease of use:

- Validate Object Integrity – checks and validates the spatial and/or attribute data of an object, according to the options specified in the Munsys Options dialog box:
 - When the Validate Geometry: Modified objects option has been selected, the geometry of only new or modified objects will be validated.
 - When the Validate Geometry: All objects option has been selected, all the objects in the selection set will have their geometry validated. This includes locked, unlocked, modified and non-modified objects.

When the object integrity check has completed and changes in objects have been encountered that may affect network integrity, a warning message to this effect is displayed if the option was specified in the Munsys Options dialog box.

- Validate Network Integrity – validates the rules that, together with the objects, make up a network, and according to the Network Integrity options specified in the Munsys Options dialog box. Network validation includes the topology and connectivity aspects, where topology is resembled in the geometry of objects and connectivity by means of attributes attached to objects.

This function is dependent on the relationships between objects, and therefore requires more objects to be included as part of the validation process than only those that were modified. The Validate Network Integrity function allows non-validated objects to be selected, but does not attempt to reset any integrity flags. It only places integrity markers when errors are encountered in the network. If the selection set contains objects that have not been validated by the Validate Object Integrity function, an Object Integrity Warning is displayed, recommending that object integrity has to be checked before network integrity.

Note

The *INTEG_NETWORK_AUTCHECK* application setting (Include Object in Network Integrity Check), which is set by the database administrator in the Munsys Management Console, allows a network integrity check to be performed automatically whenever an object integrity check is run. The same network rules and settings still apply. When the integrity check is completed, the **Integrity Results** dialog box displays a combined list of both object and network validations that were performed during the integrity check. When this setting is enabled, the object integrity check cannot be [integrated with the database posting function](#), and the **Automatically perform Object Integrity** option on the **Munsys Options** dialog box **Preferences** tab will be unavailable.

When road object integrity is checked, the following is verified:

Validation check/error condition	Description
Unlocked objects not rectified	Indicates that an object could have been rectified but, because it was unlocked, the integrity check failed to rectify the object and it was left as is.
Short spatial objects	Applies to any object with a length shorter than the Munsys Roads database tolerance setting.
Duplicate points in spatial objects	Applies to redundant coordinates being removed from an object. If the coordinates are within *SNAP* tolerance, they are discarded.
Objects with incomplete geometry	Refers to objects that do not have geometry, for example: tags that were placed without using the polygon builder process do not have a geometry.
Objects outside database extents	Checks if the objects selected are within the confines of the geographic extents of the database.
Attribute rules	Checks for the attribute rules as specified in the MUNSYS_INTEG_ATTR table, for example NULL values, etc.
Attribute data types	Checks the data type to be consistent with what is in the database; i.e. attached attributes should not exceed the limits of the table's column definition, for example: a tag may not be longer than the table's TAG_VALUE column width.

Table 14 The road object integrity check

When road network integrity is checked, the following is verified:

Validation check/error condition	Description
Unlocked objects not rectified	Indicates that an object could have been rectified but, because it was unlocked, the integrity check failed to rectify the object and it was left as is.
Center lines within snap tolerance	Road center lines are checked to see whether they were snapped to other road center line end points. Where road center line end points are not exactly on the other end point, but within *RMS_RDCL_TOL* tolerance, these are adjusted where possible.
Intersections within snap tolerance	Intersection markers are checked to see whether they are within tolerance of the road center line end points. Where an intersection marker is not exactly on the road center line end point, but within *RMS_RDINT_TOL* tolerance of the end point, the intersection marker is adjusted when possible.
Intersections with too many center lines	A rule specifies that a road intersection may only be connected to a specified maximum number of roads.
Intersections with too few center lines	A rule specifies that a road intersection must be connected to a minimum number of roads.
Duplicate intersections	Two intersection markers on top of each other within *RMS_RDINT_TOL* tolerance.
Center lines without intersections	A check is done to see that each road center line is connected to an intersection marker at both ends of the road.
Isolated intersections	An intersection marker that is not connected to any road center line.

Table 15 The road network integrity check

Checking road object integrity

- 1 Do one of the following:
 - Choose **Capture > Data Integrity > Validate Object Integrity...**
 - Click the **Validate Object Integrity** button on the **Integrity** toolbar.
- 2 Select the objects that you want to validate, and then press **ENTER**.

The Integrity Results dialog box is displayed, providing summarized information and validation results encountered during the object integrity check.

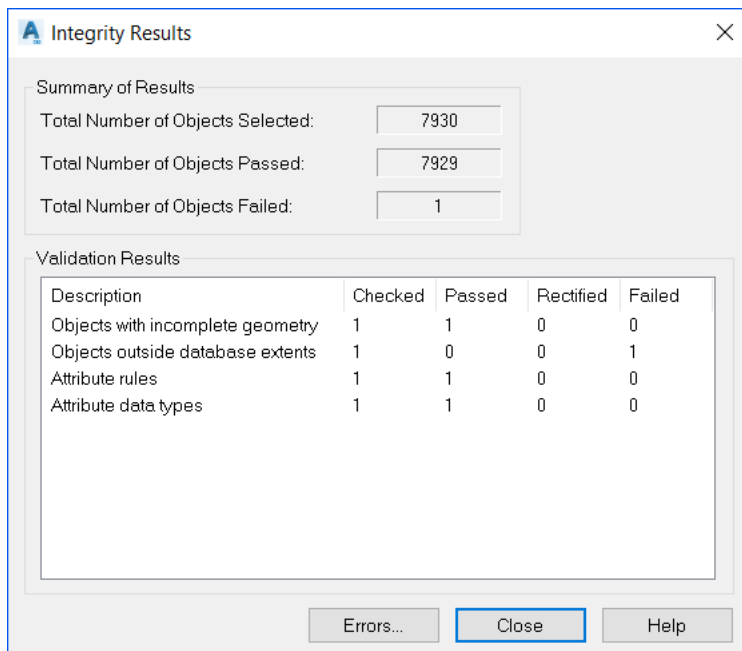


Figure 16 The Integrity Results dialog box

- 3 If you selected the **Notify when objects require network validation** option on the Munsys Options dialog box, and if objects were encountered during the integrity check that may affect network integrity, the following message is displayed:

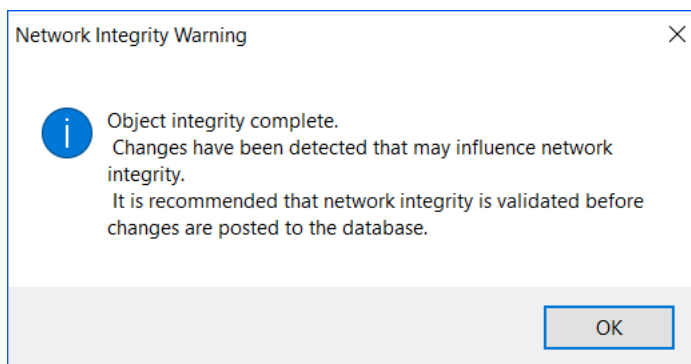


Figure 17 Network Integrity Warning

Checking road network integrity

- 1 Do one of the following:
 - Choose **Capture > Data Integrity > Validate Network Integrity...**
 - Click the **Validate Network Integrity** button on the **Integrity** toolbar.
- 2 Select the objects that you want to validate, and then press **ENTER**.

Note If you selected objects that have not been validated by the **Validate Object Integrity** function, the following message is displayed:

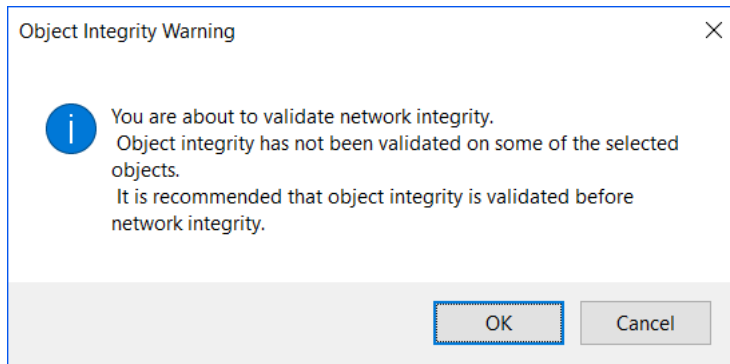


Figure 18 Object Integrity Warning

- 3 When the integrity check has completed, the **Integrity Results** dialog box is displayed, providing summarized information and validation results encountered during the network integrity check.

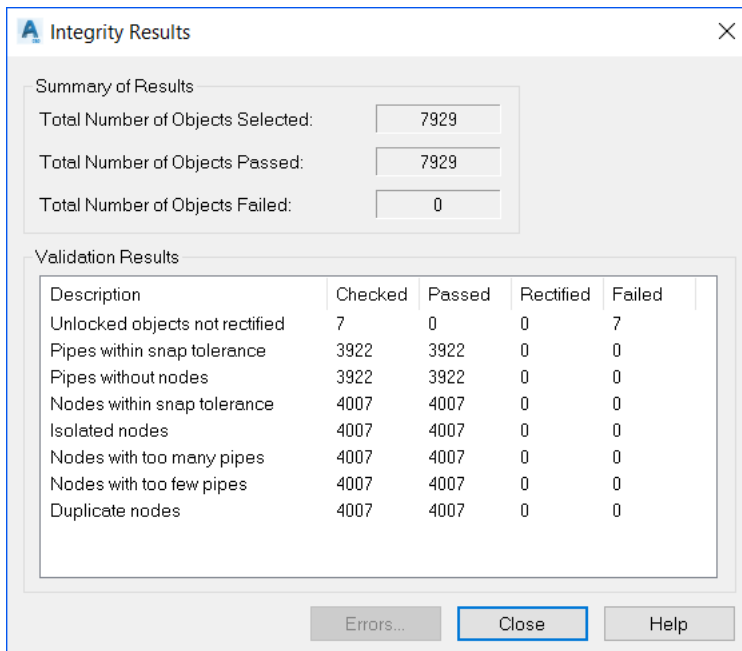


Figure 19 The Integrity Results dialog box

Browsing integrity markers

You can review the integrity markers resulting from the integrity check with the Browse Integrity Markers dialog box. This dialog box displays the complete list of errors encountered during the integrity check. The list consists of the error type, the object affected, a description of the error, and the GID of the spatial object. From this dialog box, you can locate and remove specific integrity markers in the drawing.

To browse integrity markers

- 1 Do one of the following:
 - Choose **Capture > Browse Integrity Markers...**
 - Click the **Browse Integrity Markers** button on the **Integrity** toolbar.
 - Click the **Errors...** button on the **Integrity Results** dialog box.

The Browse Integrity Markers dialog box is displayed.

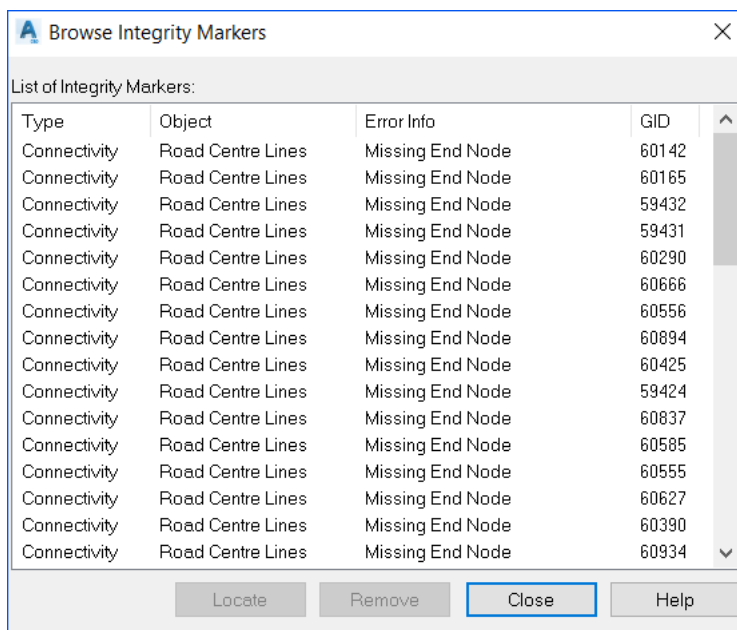


Figure 20 The Browse Integrity Markers dialog box

- 2 To locate an error, select the appropriate integrity marker, and then click the **Locate** button. Munsys zooms to the extent of the spatial object to which the integrity marker refers.
- 3 To remove integrity markers from the list *and* from the drawing, select one or more integrity markers from the list, and then click the **Remove** button.

The integrity markers are removed from the drawing and from the list of markers.

Erasing integrity markers

With this function, you can erase all the integrity markers. Integrity markers are stored on the INTEG layer.

To erase integrity markers

1 Do one of the following:

- Choose **Capture > Erase Integrity Markers**.
- Click the **Erase Integrity Markers** button on the Integrity toolbar.

The command line prompts you for confirmation to erase all the integrity markers.

2 Press **ENTER** to erase the integrity markers.

The integrity markers are erased.

Posting road data to the database

New or modified road data that has passed the integrity check is posted to the database.

To post road data to the database

1 Do one of the following:

- Choose **Capture > Post to Database...**
- Click the **Post to Database** button on the **Integrity** toolbar.

The Database Posting Summary dialog box is displayed.

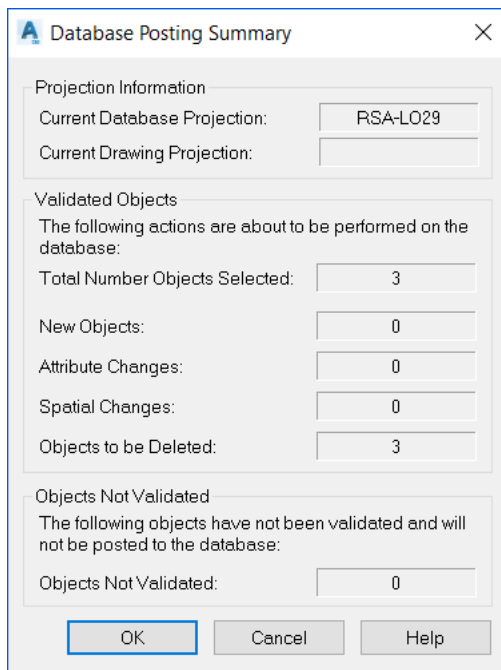


Figure 21 The Database Posting Summary dialog box

This dialog box displays the following:

- The total number of spatial objects selected for posting.

- The number of new objects created.
- The number of attribute changes made.
- The number of spatial changes made.
- The number of objects marked for deletion.
- The number of objects that have not been validated and that will not be posted to the database.

2 Click **OK** to update the database.

The Database Posting Results dialog box is displayed.

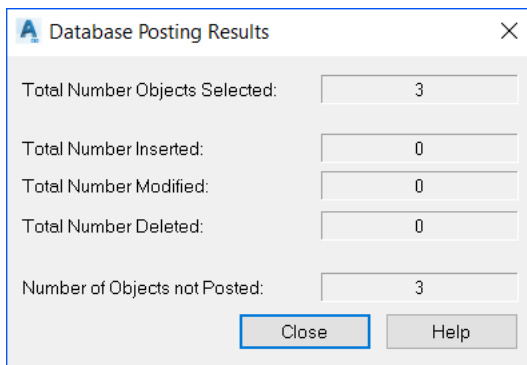


Figure 22 The Database Posting Results dialog box

This dialog box displays the following:

- The total number of objects selected for posting to the database.
- The total number of spatial objects inserted into the database.
- The total number of spatial objects modified in the database.
- The total number of spatial objects deleted from the database.
- The total number of objects not posted to the database.

3 Click **Close** to exit the **Database Posting Results** dialog box.

Note

Once you have posted objects to the database, you will not be able to undo this function, which will avoid duplicate objects and keep the content of the drawing synchronized with the database.

Validating object integrity and posting data at the same time

If you select the Automatically perform Object Integrity option on the Munsys Options dialog box Preferences tab, you can perform an object integrity check and database posting operation at the same time. The following rules will be applied when the objects integrity phase of the operation is executed:

- Only modified objects will be selected for object integrity
- The integrity flag will be reset automatically if the object passes object integrity
- Integrity markers will be placed accordingly where errors occur, as happens when a normal object integrity check is run from the Capture menu
- If an error occurs, the integrity flag will not be reset
- Only objects related to the current application will be included in the object integrity check (i.e. if you are working in the Roads application, only road objects will be checked)

If errors occurred during the object integrity check, you can do one of the following:

- Ignore the errors that occurred and continue to post the objects that passed the integrity check to the database
- Cancel the database posting operation and return to the map interface
- View the errors that occurred with the Browse Integrity Markers dialog box (this option also cancels the posting operation, allowing you to correct the errors first before attempting to post the objects to the database once again)

To validate object integrity and post objects at the same time

- 1 On the **Munsys Options** dialog box **Preferences** tab, select the **Automatically perform Object Integrity** check box in the **Database Posting Preferences** group.

- 2 Choose **Capture > Post to Database**.

An object integrity check is run on the all the new or modified objects in the drawing.

- 3 If any errors occurred, the following message is displayed:

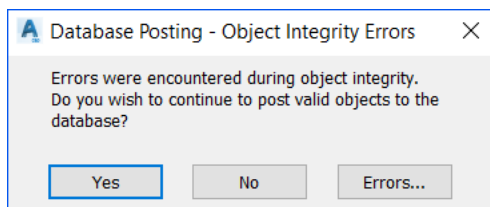


Figure 23 Database Posting – Object Integrity Errors

- 4 Do one of the following:

Click Yes to ignore the errors that have occurred and post the objects to the database that have passed the integrity check

Click No to cancel the posting operation and return to the drawing

Click Errors... to view the errors that occurred using the Browsing Integrity Markers dialog box.

Road network quality reporting

The Network Quality Report function on the Extras menu is used to validate the quality of the entire road network. The network quality report complements the network integrity check. Although it is recommended that a network integrity check is always done before objects are posted to the database, some problems might still be present in the quality of a network. This could, for example, be due to the fact that the network integrity check might have been done on a small area of the network. The network quality check uses all the objects in the database to validate the quality of the entire network. The validation is done at attribute level, without having to validate the associated spatial data.

Specific columns in each of the spatial tables are used to build up the topology of the network. The network quality report will validate these values based on roads-specific rules.

Any network errors that have been found are populated to the `MUNSYS_INTEG_RESULTS` table, together with the appropriate error message related to each spatial object where an error occurred. The `MUNSYS_INTEG_RESULTS` table can be used to set up a query, which will use this table as a linked table with a condition based on the `SP_TABLE` column that matches the spatial table name of the query.

If a single spatial object contained more than one error, a record will be stored for each error that occurred within that object. You can also have the errors populated to the `COMMENTS` column of the object(s) in which errors occurred, if you do not traditionally use this column for other purposes. If more than one error has occurred in an object, the `COMMENTS` column is populated with the last error that is found.

The following table shows the road network errors that may occur:

Spatial Table	Error	Description
SP_RDCL	NODE MISSING	The value in the <code>START_INT/END_INT</code> column is Null, or the node ID was not found in the <code>SP_RDINT</code> table
SP_RDCL	INVALID VALUE	The value in the <code>STR_CODE</code> column was not found in the <code>LU_CMS_STRNAME</code> table if the column value is not null
SP_RDINT	ID NULL	The value in the <code>INT_ID</code> column is Null
SP_RDINT	INVALID VALUE	The value in <code>STR_CODE1</code> , <code>STR_CODE2</code> , <code>STR_CODE3</code> , <code>STR_CODE4</code> was not found in the <code>LU_CMS_STRNAME</code> table, or the <code>STR_CODE1</code> value is Null
SP_RDINT	SEQUENCE EXCEEDED	The value in the <code>INT_ID</code> column exceeds the current value of the sequence <code>RMS_INTMARK</code>
SP_RDINT	ID NOT UNIQUE	The <code>INT_ID</code> column contains a non-unique value
SP_RDINT	NODE ISOLATED	The <code>INT_ID</code> was not found in either <code>START_INT</code> or <code>END_INT</code> of the <code>SP_RDCL</code> table

Figure 24 Road network quality errors

To validate road network quality

1 Choose **Extras > Network Quality Report...**

The command line displays the message: Generating network quality report

2 If errors were found in the network, the following message is displayed:

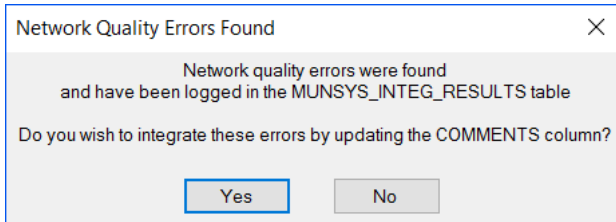


Figure 25 Network Quality errors found

3 Click **Yes** if you want the **COMMENTS** column updated, or **No** if you do not want the column updated.

The Save Results Summary As dialog box is displayed.

4 Save the report to a location of your choice.

The report is opened in Windows Notepad, and contains the following information:

- The number of objects that were checked
- The number of objects found that violated the network rules
- The number of endpoints that were found in the network
- The number of errors that were found, grouped by error type

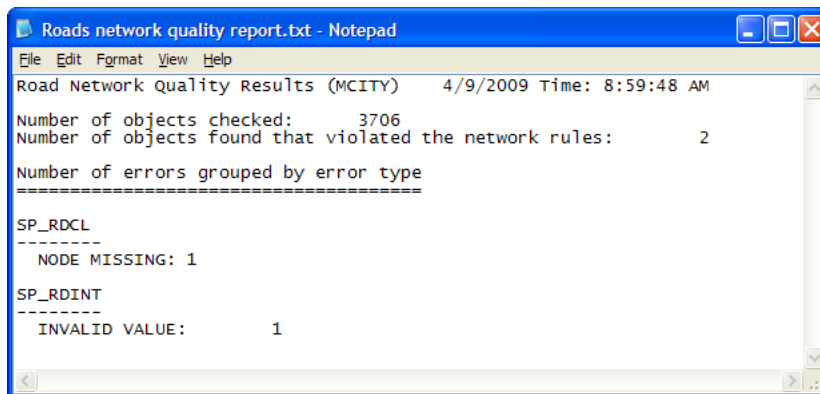


Figure 26 A road network quality report

Generating roads data status reports

Data status reports provide summarized information about spatial objects that are currently stored in the database. Once a report has been generated, it is saved to a comma delimited file, and then displayed in Notepad for easy viewing. The following reports can be generated for road objects:

- a summary of all the road objects in the database
- a summary of the road length, grouped by segment type
- a summary of the road length, grouped by road surface type
- a summary of the road length, grouped by road width
- a summary of the road length, grouped by class
- a summary of the road length, grouped by road owner
- a summary of the road length, grouped by jurisdiction
- a summary of the number of road intersection markers, by road type

To generate a roads data status report

- 1 Choose **Extras > Data Status Report...**

The Data Status Report dialog box is displayed, showing a list of all the reports that can be generated.

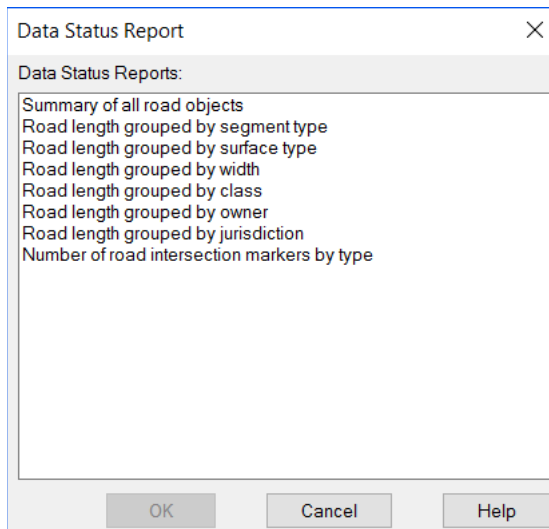
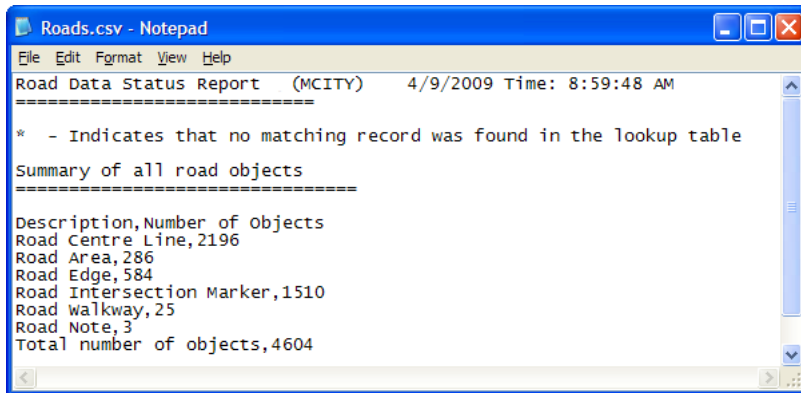


Figure 27 The Data Status Report dialog box

- 2 Select one or more reports to generate from the list, and then click OK.
- 3 Save the file to a location of your choice.

The file is opened in Windows Notepad.



Data status report for road objects

Converting AutoCAD entities to road objects

With Munsys, you can convert selected AutoCAD entities to Munsys Roads objects. Block entities can be converted to intersection markers, line entities can be converted to road center lines, road edges and walkways, text can be converted to road notes, and polygons can be converted to road areas.

Although some basic attributes are assigned as part of the conversion process, you will need to assign attributes to the objects created with the conversion process.

To convert block entities to road intersection markers

With this function, you can convert AutoCAD block entities to any of the following road intersection markers:

- freeway
- traffic light
- normal
- dead end
- node

1 Do one of the following:

- Choose **Extras > Convert Block to > Freeway Int Marker**.
- Choose **Extras > Convert Block to > Traffic Light Int Marker**.
- Choose **Extras > Convert Block to > Normal Int Marker**.
- Choose **Extras > Convert Block to > Dead End Int Marker**.
- Choose **Extras > Convert Block to > Node Int Marker**.

2 Select the block entities that you want to convert, and then press **ENTER**.

One road intersection marker is created for each block entity that you selected, and the drawing is updated accordingly.

To convert line entities to road objects

With this function, you can convert line entities to any of the following road objects:

- road center lines
- walkways
- road edges

- 1 Do one of the following:
- 2 Choose **Extras > Convert Line to > Road CL**.
- 3 Choose **Extras > Convert Line to > Road Walkway**.
- 4 Choose **Extras > Convert Line to > Road Edge**.
- 5 Select the line objects that you want to convert to road objects, and then press **ENTER**.

The selected line objects are converted and the drawing is updated accordingly.

To convert text to road notes

With this function, you can convert AutoCAD text to road notes.

- 1 Choose **Extras > Convert Text to > Road Note**.
- 2 Select the objects that you want to convert, and then press **ENTER**.

The entities are converted to road notes, and the drawing is updated accordingly.

To convert polygons to road areas

With this function, you can convert polygons to road areas.

- 1 Choose **Extras > Convert Polygon to > Road Area**.
- 2 Select the polygons that you want to convert, and then press **ENTER**.

The polygons are converted to road areas, and the drawing is updated accordingly.



Chapter 5

Maintaining road data

Modifying road data

Spatial data is stored in spatial and attribute tables as records. Road objects that needs to be edited have to be queried onto their respective layers, for example, RDINT, RDCL or RDEDGE.

Once road objects such as center lines and road edges have been placed, they have to be manipulated to make certain that they are joined correctly.

Attribute values linked to road objects can be modified easily from the Change menu and toolbar, for example road name, route number and jurisdiction.

Road objects that have been changed need to be checked against the road business rules before they can be posted to the database.

Changing road objects

To extend a road object to a boundary

With this function, road center lines and road edges can be extended to a boundary object by first indicating the boundary object, and then selecting the road object to extend. The boundary object must be able to intersect with the road object.

- 1 Do one of the following:
 - Choose **Change > Extend Road Object to Boundary**.
 - Click the **Extend Road Object to Boundary** button on the Munsys Roads **Change** toolbar.



- 2 Select the boundary object where the road object has to extend to.
- 3 Select the road object that needs to extend.

The road object is extended as indicated.

To extend a road object by distance

This function extends a road object (center line, walkway or road edge) by a specified distance at the endpoint closest to a selected point on the object. You are prompted for the distance to extend the road object with. You can also use this function to shorten a road object by entering a negative distance, for example, -50.

- 1 Do one of the following:
 - Choose **Change > Extend Road Object by Distance**.
 - Click the **Extend Road Object by Distance** button on the Munsys Roads **Change** toolbar.



- 2 Select the object that you want to extend.
- 3 Enter a distance on the command line.

The object is extended as indicated.

To extend and break a road object

This function extends a road object (center line, walkway or road edge) to a boundary object that is then broken at the intersection. The object to be broken is selected first, and then the object to extend. The object to be broken must be able to intersect with the second object.

- 1 Do one of the following:
 - Choose **Change > Extend and Break Road Object**.
 - Click the **Extend and Break Road Object** button on the Munsys Roads **Change** toolbar.



- 2 Select the object that you want to break.
 - 3 Select the object that you want to extend.
- The objects are extended and broken respectively, as indicated.

To break a road object

This function breaks a road center line, walkway or road edge nearest to a selected point on the object.

- 1 Do one of the following:
 - Choose **Change > Break Road Object**.
 - Click the **Break Road Object** button on the Munsys Roads **Change** toolbar.



- 2 Select the road object that you want to break.
 - 3 Indicate the break point.
- The road object is broken at the break point that you indicated.

Note Do not use **Object Snap**.

To change a road object

With this function, you can move the endpoint of a road center line, walkway or road edge to a new location.

- 1 Do one of the following:
 - Choose **Change > Change Road Object**.
 - Click the **Change Road Object** button on the Munsys Roads **Change** toolbar.



- 2 Select the road object that needs to move.
- 3 Specify the destination point.

The endpoint of the road object is moved to the destination point that you specified.

To fillet road objects

This function connects two road objects at an apparent intersection.

- 1 Do one of the following:
 - Choose **Change > Fillet Road Object**.
 - Click the **Fillet Road Object** button on the Munsys Roads **Change** toolbar.



- 2 Select the first road object.
- 3 Select the second road object.

The road objects are connected as indicated.

To trim a road object

You can trim a section of a road object (center line, walkway or road edge) by first selecting the cutting edge, and then selecting the section of the object to be removed. The cutting edge must be a line that intersects the road object.

- 1 Do one of the following:
 - Choose **Change > Trim Road Object**.
 - Click the **Trim Road Object** button on the Munsys Roads **Change** toolbar.



- 2 Select the cutting edge (the object that you want to trim to).
- 3 Select the object that needs to be trimmed.

Munsys trims the last indicated road object to the first one.

To join road objects

This function is used to join two road objects (road center lines or road edges), creating a single object. The attributes from the first object selected remain the attributes for the joined object. If there is a gap between the two objects to be joined, they are joined with a line segment. A joined object is created from the geometry of the first object selected, and the second object selected is moved to the DELETED layer. The first selected object, now the new joined object, is flagged as a change to be verified when the integrity check is run.

- 1 Choose **Change > Join Road Object**.
- 2 Select the first road object (road center line, walkway or road edge).
- 3 Select a point close to the endpoint of the second object (the road center line, walkway or road edge that you want to join).

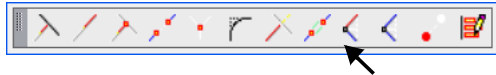
The objects are joined as indicated, and the attributes from the first object selected remain the attributes for the joined object.

To change the vertex of a road object

With this function, you can remove, move, add or insert new vertices to segments in a road object (center line, walkway or road edge).

To add a vertex to a road object

- 1 Do one of the following:
 - Choose **Change > Change Road Object Vertex > Add**.
 - Click the **Add Vertex to Road Object** button on the Munsys Roads **Change** toolbar.



- 2 Select the appropriate road object.
- 3 Select the endpoint of the road object to which you want to add a vertex.
- 4 Select the position for the new point.

The new vertex is added at the position that you indicated.

To move a road object vertex

- 1 Do one of the following:
 - Choose **Change > Change Road Object Vertex > Move**.
 - Click the **Move Vertex of Road Object** button on the Munsys Roads **Change** toolbar.



- 2 Select the appropriate road object.
- 3 Specify a point on the road object closest to the vertex that you want to move.
- 4 Specify a point to move the vertex to.

The vertex is moved to the point that you specified.

To remove a road object vertex

- 1 Choose **Change > Change Road Object Vertex > Remove**.
- 2 Select the appropriate road object.
- 3 Select the vertex that you want to remove from the road object.

The vertex that you selected is removed.

Note

A vertex can only be removed from a segment with more than two vertices.

To insert a vertex into a road object

- 1 Choose **Change > Change Road Object Vertex > Insert**.
- 2 Select the appropriate road object.

- 3 Select the segment for the inserted point.
- 4 Select a position for the new point.
The vertex is inserted at the position you selected.

Moving an intersection marker

With this function, you can move a road intersection marker to a new location by first selecting the marker, and then specifying the point where you want to place it.

To move an intersection marker

- 1 Do one of the following:
 - Choose **Change > Move Int Marker**.
 - Click the **Move Int Marker** button on the Munsys Roads **Change** toolbar.



- 2 Select the intersection marker that you want to move.
- 3 Specify a new insertion point for the intersection marker.
The intersection marker is moved to the insertion point that you specified.

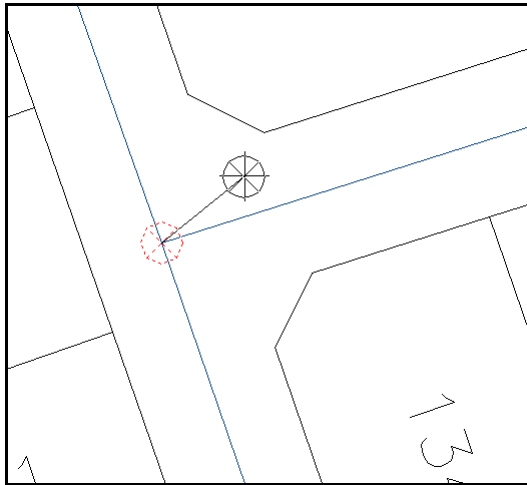


Figure 1 Moving an intersection marker

Editing road object attributes

The Edit Attributes function is used to edit the attributes of one or more selected road objects that belong to the same object type. The current application determines what object types may be selected; for example, if you are working in Munsys Roads, only road objects may be selected. If you select more than one object type (for example road center lines and road areas), you will be required to choose a single object type to edit.

Objects that are selected for editing are locked (if record locking is enabled in the database). Once the objects have been selected and an object type to edit has been specified, the Edit Attributes dialog box is displayed. This dialog box contains various options that can be used to edit the attributes of the spatial objects:

- Attribute templates – attributes can be edited using an attribute template. The attributes that will be displayed when an attribute template has been selected will depend on the attributes that have been specified on the template, as well as the formatting parameters that apply to each column selected as part of the attribute template. If no attribute template has been selected, all the attributes belonging to the spatial object type are displayed.
- Editing multiple objects simultaneously – if you select this option, attributes of multiple objects are displayed simultaneously. Where the attributes of all the selected objects are the same, a value is displayed. Where attributes of the various objects that were selected differ, a value of *VARIES* is displayed. When a change is made to a value, the new value is applied to all the selected objects. If you do not select the Edit multiple objects simultaneously check box, you can edit the selected objects one by one. The values that are changed are only applied to the object that is currently selected.
- AutoZoom – this option is only available when the Edit multiple objects simultaneously option is not selected, i.e. when you are going to edit the objects one by one. If the AutoZoom to object option is selected, Munsys will zoom to each object in the drawing as it becomes the current object, and highlight it. The object navigation buttons are used to move from one object to the next.

The various attributes are displayed on the Edit Attributes dialog box in three columns: Description, Value and Column Name. You can resize the dialog box for easier viewing. Values that may not be edited are unavailable. Attributes are edited in the *Value* column, either by typing a new value or by selecting a value from a drop-down list. Changes that are made are applied to objects in the drawing. These changes will only be updated in the database when the object integrity check has been run and the objects have been posted to the database.

To edit road object attributes

- 4 Choose **Change > Edit Attributes...**
- 5 Select the objects that you want to edit, and then press ENTER.

If you selected more than one object belonging to different object types, the Spatial Object Identification dialog box is displayed.

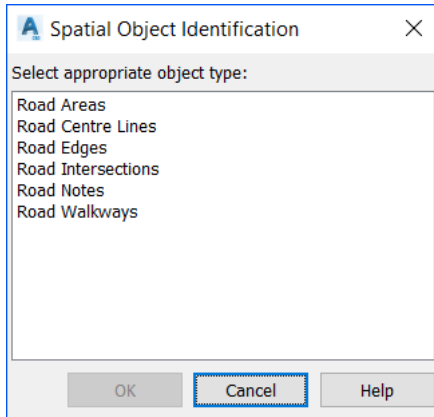


Figure 2 The Spatial Object Identification dialog box

- 6 Select a single spatial object type to edit, and then click OK.
The Edit Attributes: [*Object Type*] dialog box is displayed.

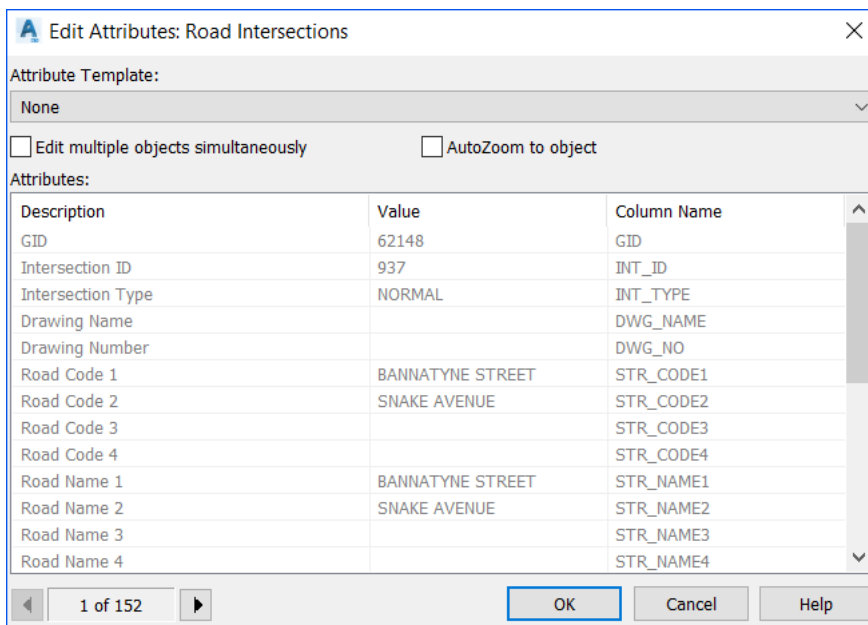


Figure 3 The Edit Attributes dialog box

- 7 If you want to edit the objects using an attribute template, select the appropriate attribute template from the **Attribute Template** list. If you do not want to make use of an attribute template, select **None**.

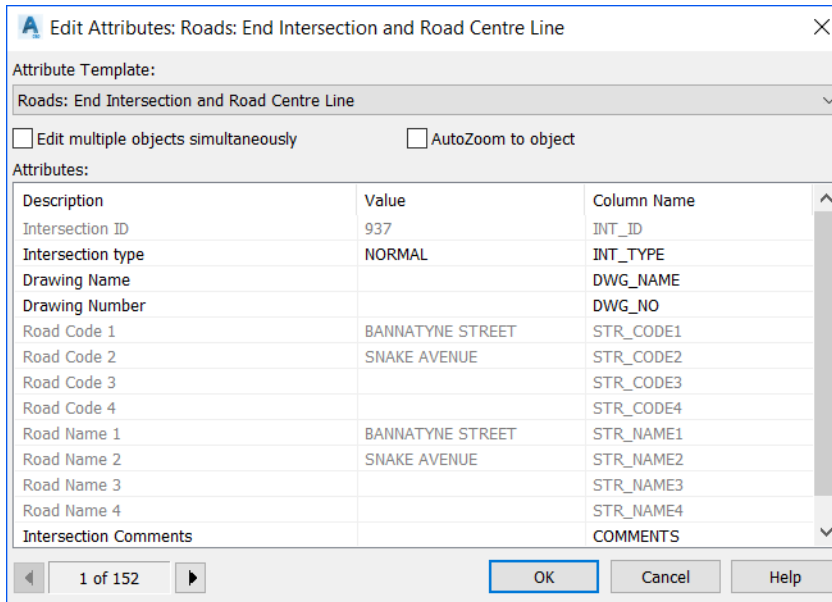


Figure 4 Edit Attributes: Selecting an attribute template

- If you want to edit the attributes of all the selected objects at the same time, select the **Edit multiple objects simultaneously** check box.

Similar values are displayed, while values that differ between objects are displayed as **VARIES**, as seen in the following figure:

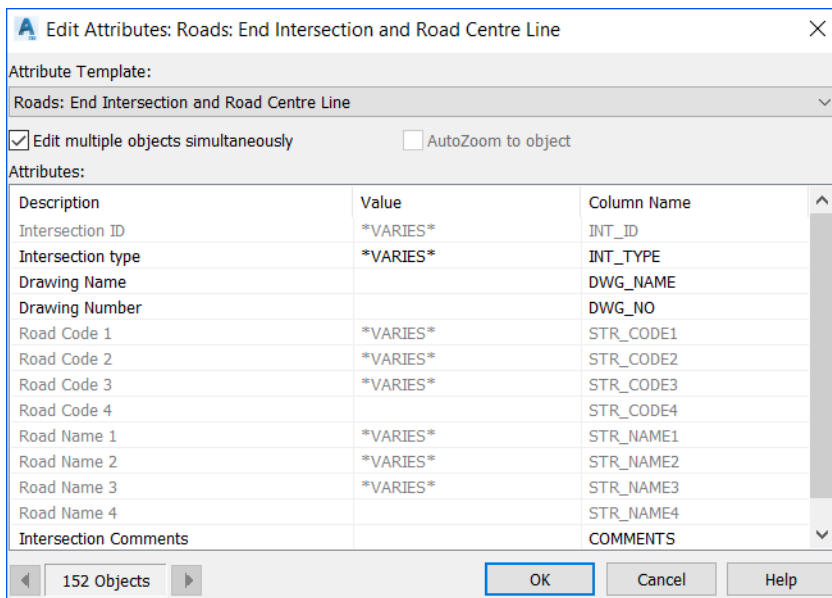


Figure 5 The Edit Attributes dialog box: Edit multiple objects simultaneously

- If you want to edit the selected objects one by one, clear the **Edit multiple objects simultaneously** check box. Select the **AutoZoom to object** check box to zoom to the objects one by one and highlight them. The object navigation buttons are used to move from one object to the next.

- 10 To edit an attribute, do one of the following:
 - Highlight a value, and then choose a new value from the **Value** column list.
 - Highlight a value, and then enter a new value in the **Value** column
- 11 Click OK to apply the new value(s) to the object(s).
- 12 The values are applied to the objects, to be verified with the object integrity check.

Editing linked table attributes

This function is used to edit spatial object attributes that exist in linked tables. Linked table attributes are updated directly to the database. The current application determines what object types may be selected; for example, if you are working in Munsys Roads, only road objects may be selected. If you select more than one object type (for example road center lines and road areas), you will be required to choose a single object type to edit. You can only select objects that have previously been posted to the database.

The link tables that can be edited using this function must be defined through an attribute template. The applicable attribute template is selected from a list, which is created by filtering attribute templates according to the following characteristics:

- Only attribute templates associated with the current spatial object type, being edited are included – the primary table in the attribute template is the same table from which the spatial objects were queried.
- Only attribute templates that contain linked tables are included
- The linked table specified may not be a Munsys spatial table
- The user must have edit privileges to the linked table
- The link column used to describe the relationship with the primary table must reference a true column in the linked table. This may not be an expression.

Attributes are displayed on the Linked Table Attributes dialog box in three columns: Description, Value and Column Name. You can resize the dialog box for easier viewing. Values that may not be edited are unavailable. Attributes are edited in the Value column by typing in a new value. Navigation buttons are used to move between the various records that are available and to move from one object to the next. You can also insert records into, or delete records from a linked table, depending on the privileges you have on the link table.

The procedure for editing linked table attributes is described in detail in the *Munsys Concepts User Manual*.

Changing a road name

With this function, you can change the road name attached to selected road center lines. The new road name is selected from a list of road names on the Select Road Name dialog box.

To change a road name

- 1 Do one of the following:
 - Choose **Change > Change Road CL Attribute > Road Name...**
 - Click the **Road Name** button on the Munsys Roads **Attribute** toolbar.



- 2 Select the appropriate road center lines.

The Select Road Code dialog box is displayed, highlighting the current road name. If you selected multiple road center lines with different road names, no current road name is highlighted.

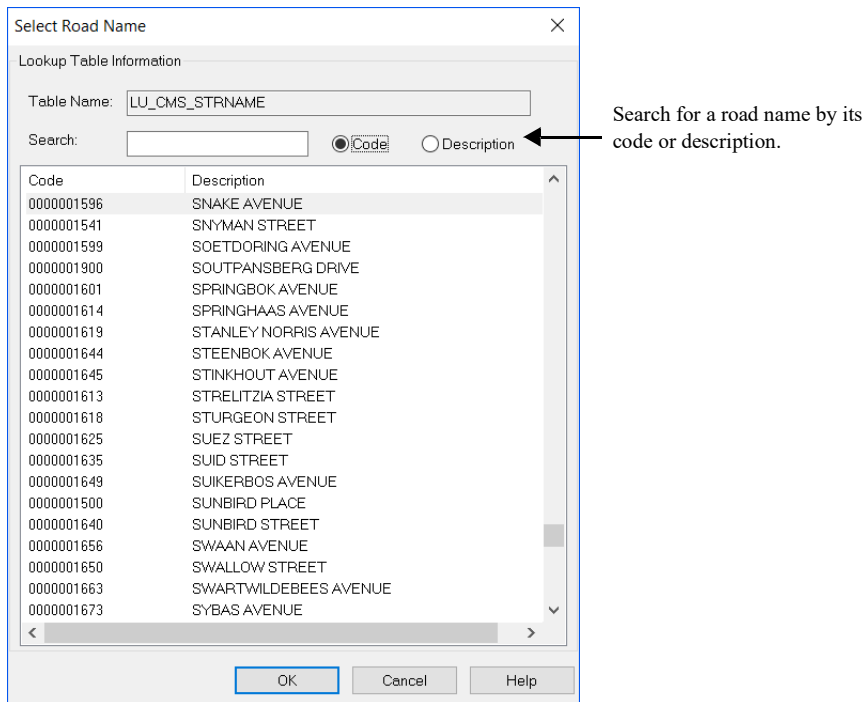


Figure 6 The Select Road Code dialog box

- 3 Select a new road name from the list, and then click **OK**.
The road name is changed as specified.

Changing a route number

With this function, you can change the route number of selected road center lines from a list of available route numbers on the Select Route Number dialog box.

To change a route number

- 1 Do one of the following:
 - Choose **Change > Change Road CL Attribute > Route Number...**
 - Click the **Route Number** button on the Munsys Roads **Attribute** toolbar.



- 2 Select the appropriate road center lines, and then press **ENTER**.

The Select Route Number dialog box is displayed, highlighting the current route number. If you selected multiple road center lines, no current route number is highlighted.

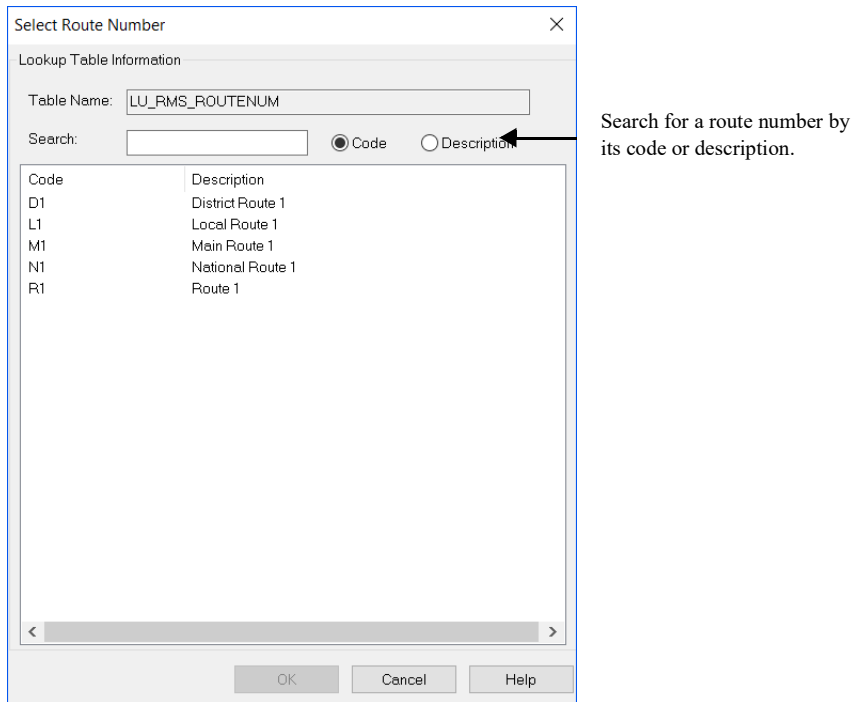


Figure 7 The Select Route Number dialog box

- 3 Select a new route number from the list, and then press **ENTER**.
The new route number is assigned to the selected road center lines.

Changing road width

With this function, you can change the width of a road by selecting the appropriate road center lines, and then entering the new road width in the Road Width text box.

To change road width

- 1 Do one of the following:
 - Choose **Change > Change Road CL Attribute > Road Width**.
 - Click the **Road Width** button on the Munsys Roads **Attribute** toolbar.



- 2 Select the appropriate road center lines, and then press **ENTER**.
The Road Width text box is displayed.

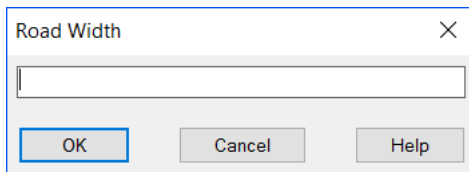


Figure 8 The Road Width text box

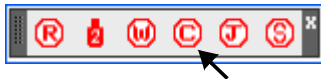
- 3 Enter the new road width, and then click **OK**.
The new road width is assigned to the selected road center lines.

Changing road classification

With this function, you can change the classification of selected road center lines from the Select Road Classification dialog box.

To change road classification

- 1 Do one of the following:
 - Choose **Change > Change Road CL Attribute > Road Classification...**
 - Click the **Road Classification** button on the Munsys Roads **Attribute** toolbar.



- 2 Select the appropriate road center lines, and then press **ENTER**.
The Select Classification dialog box is displayed.

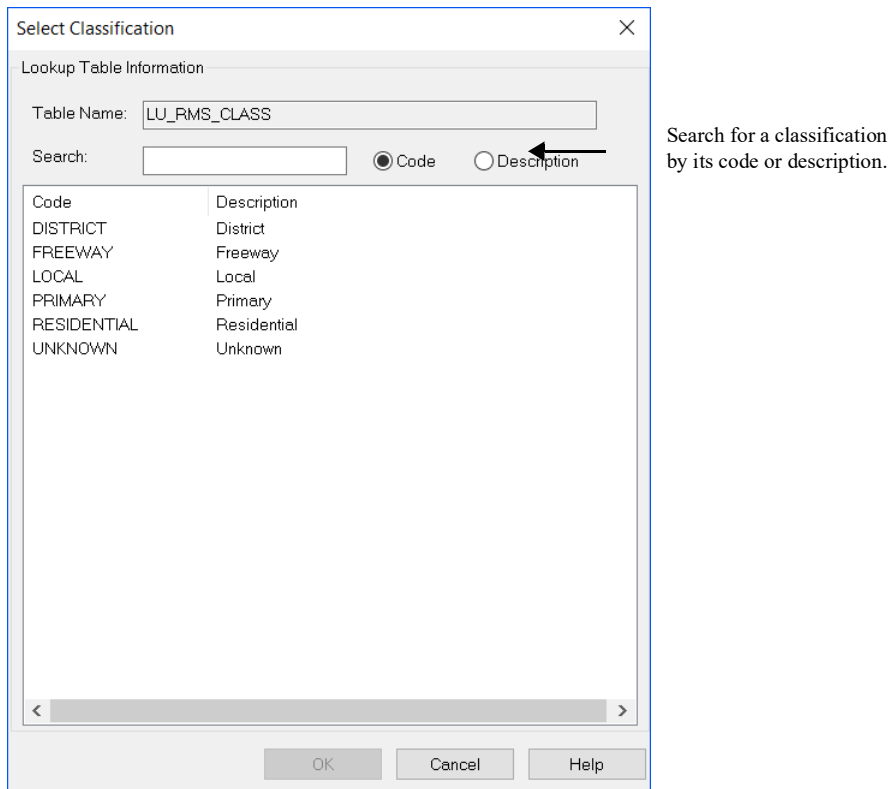


Figure 9 The Select Classification dialog box

- 3 Select a road classification from the list, and then click **OK**.
The road classification is assigned to the selected road center lines.

Changing road jurisdiction

With this function, you can change the jurisdiction that has been assigned to selected road center lines.

To change road jurisdiction

- 1 Do one of the following:
 - Choose **Change > Change Road CL Attribute > Road Jurisdiction**.
 - Click the **Road Jurisdiction** button on the Munsys Roads **Attribute** toolbar.



- 2 Select the appropriate road center lines, and then press **ENTER**.
- 3 Do one of the following to assign a new jurisdiction:
 - Press **ENTER** if the selected road center lines fall within the jurisdiction.
 - On the command line, type **N** if the selected road center lines do not fall within the jurisdiction.The jurisdiction is changed accordingly.

Changing a road owner

With this function, you can change the default road owner that was assigned to road center lines during the capture process.

To change a road owner

- 1 Choose **Change > Change Road CL Attribute > Road Owner...**
- 2 Select the appropriate road center lines, and then press **ENTER**.
- 3 The **Select Owner** dialog box is displayed.

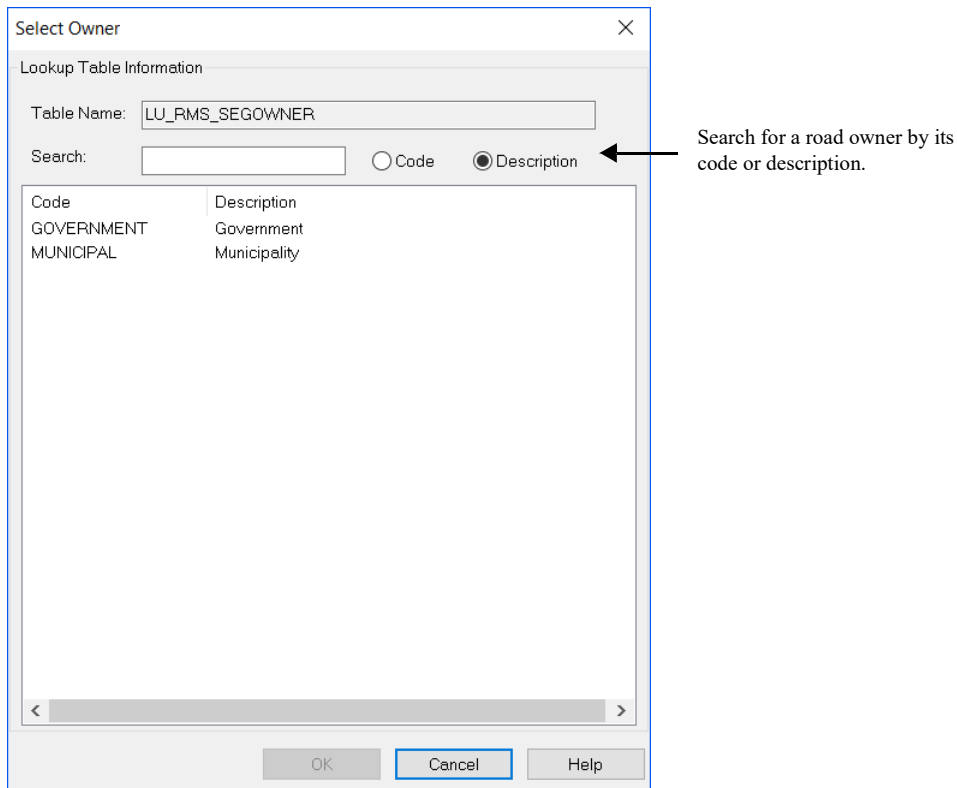


Figure 10 The Select Owner dialog box

- 4 Select a new road owner from the list, and then click **OK**.
The road owner is changed as specified.

Changing a road type

With this function, you can change the default road type that was assigned to road center lines during the capture process.

To change a road type

- 1 Choose **Change > Change Road CL Attribute > Road Type...**
- 2 Select the appropriate road center lines, and then press **ENTER**.
- 3 The **Select Type** dialog box is displayed.

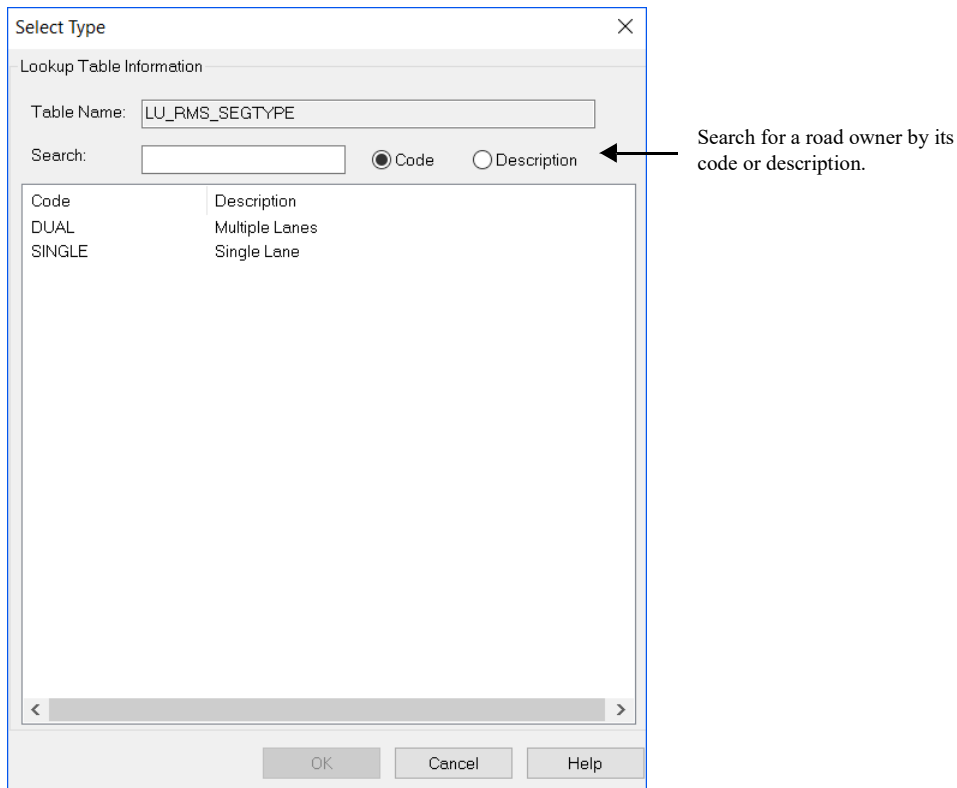


Figure 11 The Select Type dialog box

- 4 Select a new road type from the list, and then click **OK**.
The road type is changed as specified.

Changing road surface type

With this function, you can change the road surface type of selected road center lines.

To change road surface type

- 1 Do one of the following:
 - Choose **Change > Change Road CL Attribute > Road Surface Type...**
 - Click the **Road Surface Type** button on the Munsys Roads **Attribute** toolbar.



- 2 Select the appropriate road center line/s, and then press **ENTER**.
The Select Surface Type dialog box is displayed.

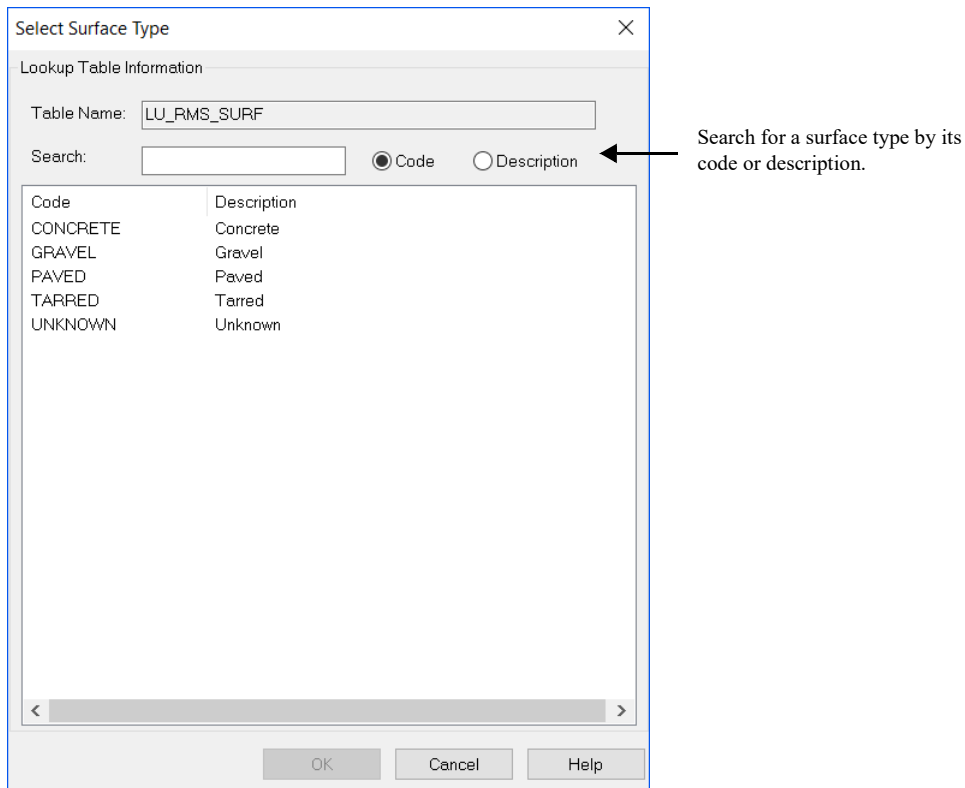


Figure 12 The Select Surface Type dialog box

- 3 Select a new road surface type from the list, and then click OK.
The new road surface type is assigned to the selected road center lines.

Changing a road edge type

This function is used to change a road edge type. Road edges can be mountable, semi-mountable or non-mountable kerbs.

To change a road edge type

- 1 Choose **Change > Change Road Edge Attribute > Road Edge Type...**
- 2 Select the road edge that you want to change.

The Select Road Edge Type dialog box is displayed.

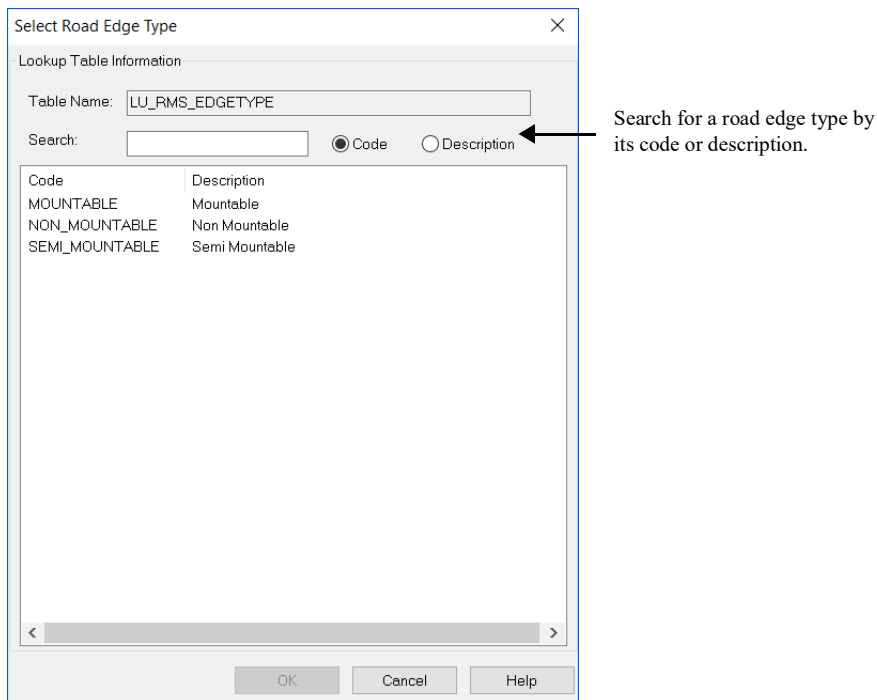


Figure 13 The Select Road Edge Type dialog box

- 3 Select the required road edge type from the list, and then click **OK**.

Tip Use the **Search** field to search for a road edge type by its code or description.

To ReSync Road Names

On occasion when a road is renamed, the road center line/s must be updated to reflect the road name change(s). The ReSync function forces road name attributes for road center line/s to be re-synchronized after any road names have been modified.

- 1 Choose **Change > Change Road CL Attribute > ReSync Road Names**
- 2 Select the road center line/s you want to resync.

The command line indicates the number of road center line/s updated.

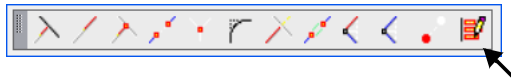
Note All road name changes must be completed and posted to the database before the resyncing of the road names can be done on the road center line/s.

Changing road notes

With this function, you can change the text of a road note, using the Road Note text box.

To change a road note

- 1 Do one of the following:
 - Choose **Change > Change Road Note...**
 - Click the **Change Road Note** button on the Munsys Roads **Change** toolbar.



- 2 Select the road note that you want to change.
The Road Note text box is displayed.

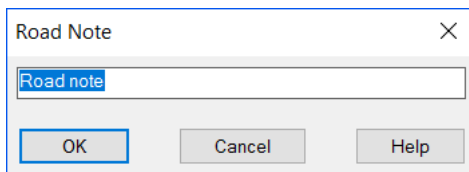


Figure 14 The Road Note text box

- 3 Change the note as required, and then click **OK**.

Adding comments

This function is used to assign descriptive comments to one or more selected objects.

To add comments

- 1 Choose **Change > Add Comment...**
- 2 Select the road object(s) to which you want to add a comment.

The Road Comment text box is displayed.

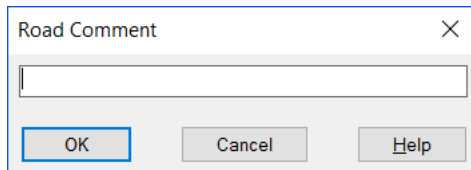


Figure 15 The Road Comment text box

- 3 In the text box, add the comment, and then click **OK**.
The comment is assigned to the selected object(s).

Deleting and undeleting road objects

With Munsys Roads, existing road objects can be deleted from the database. Multiple objects can be selected for deleting. Deleted road objects are moved to a frozen layer DELETED, which is removed from the database when changes are posted. With the Undelete function, you can restore road objects that have been moved to the DELETED layer and that are marked for deletion.

To delete road objects

- 1 Choose **Change > Delete Road Object**.
- 2 Select the road objects that you want to delete.

The command line indicates how many road objects you have selected, and how many have been filtered out.

- 3 Press **ENTER** to delete the selected road objects.

The road objects are flagged for deletion and moved to the layer DELETED. These changes are applied to the database when changes are posted.

To undelete road objects

- 1 Choose **Change > Undelete Road Object**.

The objects that you have deleted are displayed in the drawing.

- 2 Select the road objects that you want to restore.

The Delete flag is no longer set for the selected objects. In the event of spatial or attribute changes before the objects were flagged for deletion, these changes are applied.



Chapter 6

Creating road intersections

Introduction

In Munsys Roads, the Intersection menu is used to design traffic intersections containing pedestrian crossings, islands, lanes, guard rails, traffic signals, road markings and warning signs.

Road intersections are designed and saved as AutoCAD drawings that are referenced to their respective road intersection markers. All the traffic signs, markers and other details are stored as AutoCAD block entities, and may be customized to meet user requirements.

Creating an intersection drawing

When you create a road intersection, road intersection center lines are placed first, and then intersection edges. Stop lines and pedestrian crossings are placed next. Lanes are constructed and then converted to channel lines and/or dividing lines. Islands, traffic signals and their related electricity objects are placed next. Road markings and warning signs are placed in the lanes. When the intersection drawing is completed, it is saved to the database.

Drawing road intersection center lines

Road intersection center lines are used as markers for constructing lanes and specifying road width. Road *intersection* center lines do not necessarily match the road center lines.

To draw road intersection center lines

- 1 Choose **Intersection > Draw Road Int CL**.
- 2 Specify an approximate start point for the road intersection center line.
- 3 Specify an approximate end point for the road intersection center line.
- 4 Select the first segment from which to offset the road intersection center line.
- 5 Select the second segment from which to offset the road intersection center line.

A road intersection center line is constructed from the start point to the endpoint in the center of the segments indicated for offset.

Rounding off road intersection center lines

With this function, you can round off road intersection center lines, by radius or freehand.

To round lines freehand

- 1 Choose **Intersection > Round Lines > Freehand**.
- 2 Select the line that you want rounded.
- 3 Rotate your mouse in a clockwise or anti-clockwise direction, and then click to determine the radius.

To round lines by radius

- 1 Choose **Intersection > Round Lines > Radius**.
- 2 Select the line that you want rounded.
- 3 Enter a radius, at least half the length of the line.

The command line prompts for acceptance of the direction of the rounded line.

Drawing road intersection edges

With this function, you can draw a road intersection edge along the length of a road center line. Road intersection edges are captured on the RDEDGE layer.

To draw road intersection edges

- 1 Choose **Intersection > Draw Road Int Edges**.
- 2 Select the appropriate road intersection center line.
- 3 On the command line, specify the total road width, from edge to edge.

A road edge is constructed for the length of the road intersection center line.



Figure 1 Road intersection center lines and road intersection edges

To round off road intersection edges

- 1 Choose **Intersection > Round Road Edges**.
- 2 Select the first edge, then the second edge, and then enter the corner radius.

The road intersection edges are filleted by the radius that you specified.

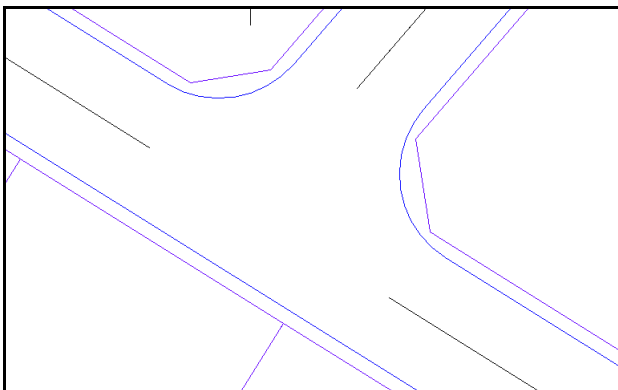


Figure 2 Round road edges

Drawing stop lines

Stop lines can be drawn freehand, or at a specified offset distance from a boundary or road intersection center line, or aligned with a boundary or a road intersection center line. Stop lines are created on the STOP_LINE layer.

To draw aligned stop lines

Aligned stop lines are drawn by first specifying a start point and an endpoint for the line, and then specifying an object to align the stop line with. The alignment object can be a road intersection center line, or a boundary segment.

- 1 Choose **Intersection > Draw Stop Lines > Aligned**.
- 2 Specify a start point for the stop line.
- 3 Specify an endpoint for the stop line.
- 4 Select a segment with which to align the stop line.

The stop line is aligned with the selected segment.

To draw offset stop lines

Offset stop lines are drawn at a specified offset distance and aligned with a selected segment. This can be an road intersection center line, or a boundary segment.

- 1 Choose **Intersection > Draw Stop Lines > Offset**.
- 2 Specify an approximate start point for the stop line.
- 3 Specify an approximate endpoint for the stop line.
- 4 Select a segment for offset.
- 5 Specify a side for offset.
- 6 On the command line, type the offset distance, and then press **ENTER**.

The stop line is aligned with the segment selected above, at the offset distance that you specified.

To draw a freehand stop line

- 1 Choose **Intersection > Draw Stop Lines > Freehand**.
- 2 Specify a start point for the stop line.
- 3 Specify an endpoint for the stop line.

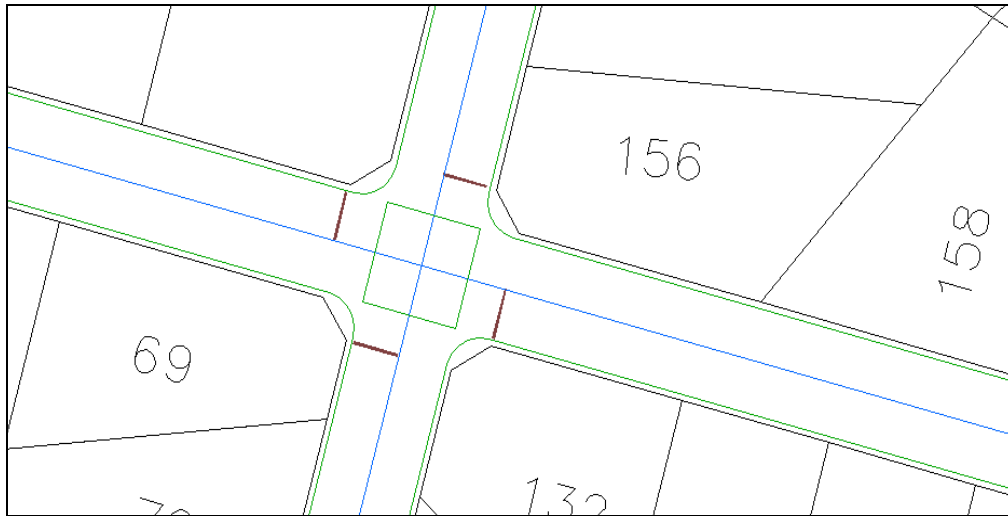


Figure 3 Stop lines

Drawing pedestrian crossings

Pedestrian crossings are drawn freehand, or at a specified offset distance from a boundary or a road intersection center line, or aligned with a boundary or road intersection center line. Pedestrian crossings are stored on the PED_CROSSING layer.

To draw an aligned pedestrian crossing

Aligned pedestrian crossings are drawn by first specifying a start point and an endpoint for the crossing, and then specifying a line to align the crossing with. The alignment line can be a center line, or a boundary segment.

- 1 Choose **Intersection > Draw Pedestrian Crossing > Aligned**.
- 2 Specify a start point for the crossing.
- 3 Specify an endpoint for the crossing.
- 4 Select a segment with which to align the crossing.

The pedestrian crossing is aligned with the selected segment.

To draw an offset pedestrian crossing

Offset pedestrian crossings are drawn at a specified offset distance and aligned with a selected line. This line can be a road intersection center line, or a boundary segment.

- 1 Choose **Intersection > Draw Pedestrian Crossing > Offset**.
- 2 Specify an approximate start point for the crossing.
- 3 Specify an approximate endpoint for the crossing.
- 4 Select an offset segment.
- 5 Specify a side for offset.
- 6 On the command line, type the offset distance, and then press **ENTER**.

The pedestrian crossing is aligned with the selected segment, at the offset distance that you specified.

To draw a freehand pedestrian crossing

- 1 Choose **Intersection > Draw Pedestrian Crossing > Freehand**.
- 2 Specify a start point for the pedestrian crossing.
- 3 Specify an endpoint for the pedestrian crossing.

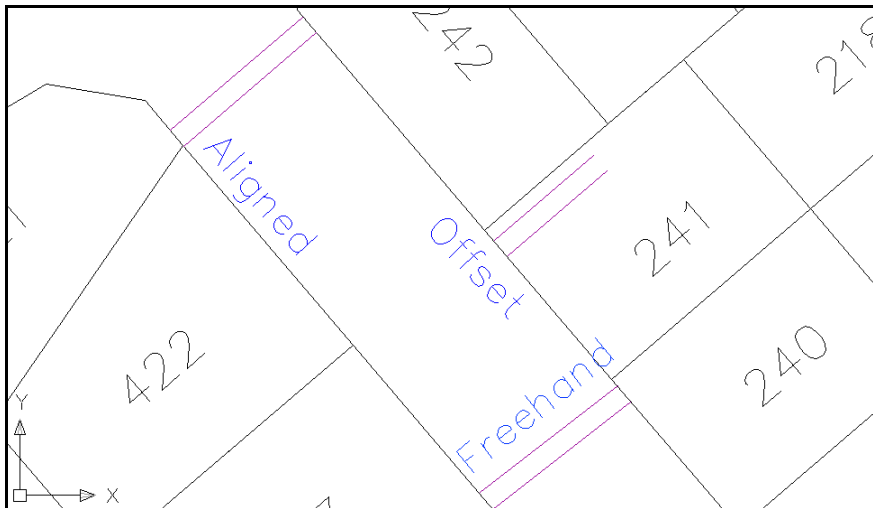


Figure 4 Pedestrian crossings

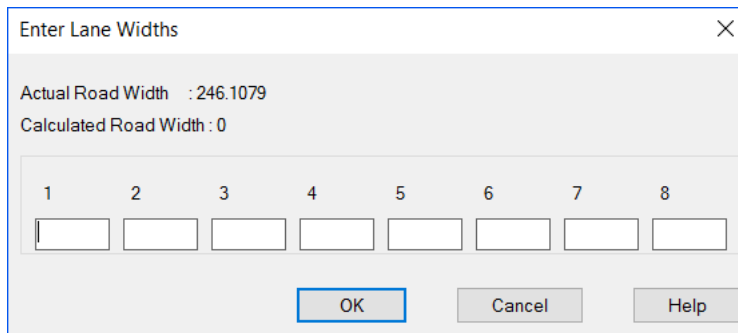
Constructing lanes

With Munsys Roads, traffic lanes are constructed by first indicating their approximate start and endpoint, selecting the two opposite road intersection edges, and then entering the lane widths using the Enter Lane Widths dialog box. The actual road width and the calculated road width are displayed as the lane widths are entered.

To construct lanes

- 1 Choose **Intersection > Construct Lanes**.
- 2 Specify an approximate start point for the lanes.
- 3 Specify an approximate end point for the lanes.
- 4 Select the first segment for offset.
- 5 Select the second segment for offset on the opposite side of the road reserve.

The Enter Lane Widths dialog box is displayed.



Enter Lane Widths

Actual Road Width : 246.1079
Calculated Road Width : 0

1	2	3	4	5	6	7	8
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

OK Cancel Help

Figure 5 The Enter Lane Widths dialog box

Enter the lane width for each of the lanes required, and then click OK.

Tip Press the **TAB** key to enter the next lane width. The total width of the lanes must match the road width.

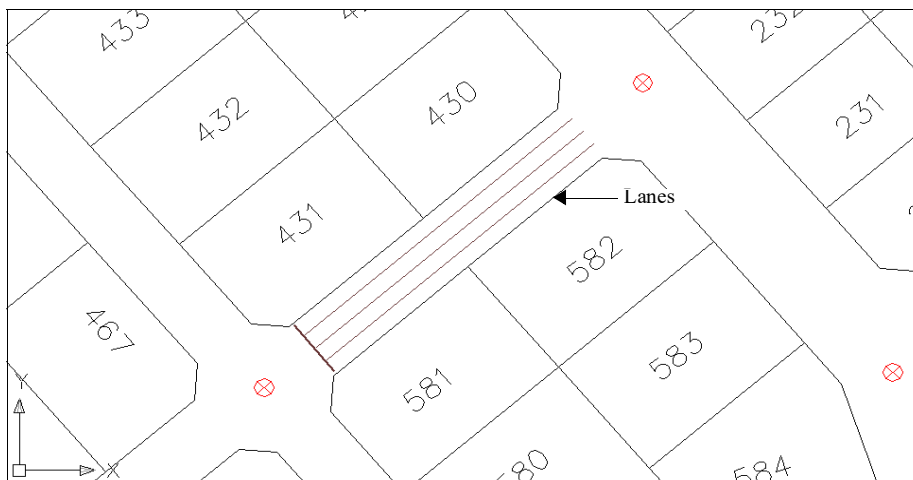


Figure 6 Constructing lanes

Setting channel lines

After lanes have been constructed, they can be converted to urban or rural channel lines. Channel lines are stored on the ROAD_LANES layer.

To set channel lines

- 1 Do one of the following:
 - Choose **Intersection > Set Channel Line > Urban**.
 - Choose **Intersection > Set Channel Line > Rural**.
- 2 Select the lane to be converted to a channel line.
- 3 Specify the start point for the line.

The lane is converted to a channel line.

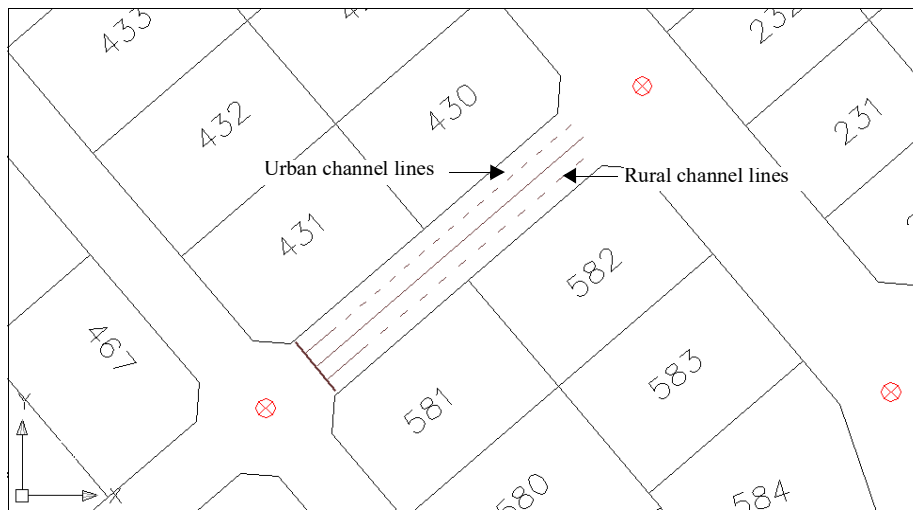


Figure 7 Setting channel lines

Setting dividing lines

After lanes have been constructed, they can be converted to urban or rural dividing lines. Dividing lines are stored on the ROAD_LANES layer.

To set dividing lines

- 1 Do one of the following:
 - Choose **Intersection > Set Dividing Line > Urban.**
 - Choose **Intersection > Set Dividing Line > Rural.**
- 2 Select the lane to be converted to a dividing line.
- 3 Specify the start point for the line.
The lane is converted to a dividing line.

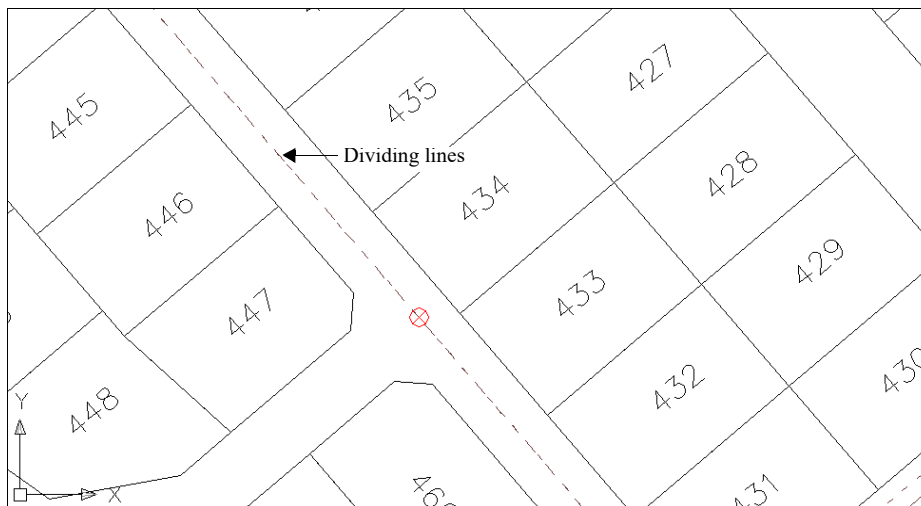


Figure 8 Setting dividing lines

Capturing islands

With Munsys Roads, you can capture islands, painted islands and hatch islands. Hatch islands can be trimmed to the required shape. Islands are constructed on the ISLANDS layer, and painted islands and hatch islands on the PAINT_ISLANDS layer.

To draw islands

- 1 Choose **Intersection > Draw Islands**.
- 2 Specify the first point for the island.
- 3 Specify next points, and then press **ENTER**.
- 4 Press **ENTER** to close the island.

To draw painted islands

- 1 Choose **Intersection > Draw Painted Islands**.
- 2 Specify the first point for the painted island.
- 3 Specify next points, and then press **ENTER**.
- 4 Press **ENTER** to close the painted island.

To insert hatch islands

- 1 Choose **Intersection > Hatch Islands**.
- 2 Specify the first hatch corner.
- 3 Resize the window, and then specify the second corner.

The hatch island can be trimmed to the required shape by using the standard AutoCAD functions.

Capturing guard rails

When guard rails are captured, guard rail poles are placed first, and then the segment on which the guard rail poles have been placed is changed to a guard rail. When guard rail poles are placed, a circle with the radius equal to the distance between the poles is displayed around every pole, to simplify the placing of the next pole. Guard rail poles are created on the GUARD_RAILS layer.

To place guard rail poles

- 1 Choose **Intersection > Place Guard Rail Poles**.
- 2 On the command line, enter the desired distance between the poles, and then press **ENTER**.
- 3 Specify an insertion point for the first pole.
- 4 A circle with the radius specified in **Step 2** is displayed around the pole to simplify the placing of the next pole.
- 5 Specify the insertion points for the next poles, and then press **ENTER**.
- 6 Specify the side of the line to place the guard rail poles.

The guard rails are placed as indicated.

To place guard rails

- 1 Choose **Intersection > Change to Guard Rails**.
- 2 Select the segment that you want to change to a guard rail.

The segment is converted to a guard rail, and placed on the GUARD_RAILS layer.

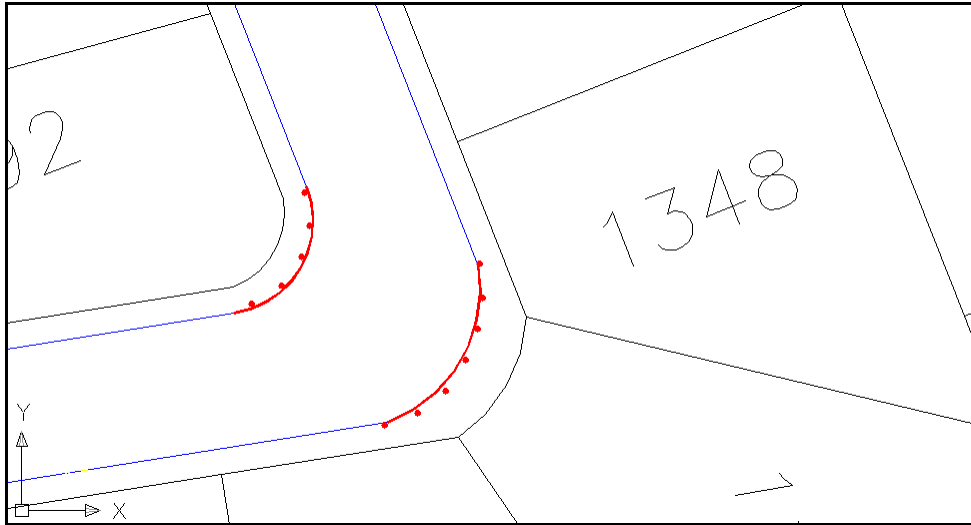


Figure 9 Guard rails

Capturing traffic signals

With Munsys Roads, you can place the following traffic signal poles into an intersection drawing:

- Standard pole
- Cantilever Type 1
- Cantilever Type 2
- Extended pole
- Non-standard pole

Traffic signal poles are placed on the SIGNAL_POLES layer.

When the traffic signal poles have been placed, they can be numbered, preferably in a clockwise direction. Non-standard and extended poles cannot be numbered. Next, signal faces are attached to the signal poles. Signal faces should be placed facing oncoming traffic.

To place traffic signal poles

- 1 Do one of the following:
 - Choose **Intersection > Place Signal Pole > Standard Pole/Cantilever Type 1/Cantilever Type 2/Extended Pole/Non-Standard Pole**.
- 2 Specify the position for the traffic signal pole.
- 3 Rotate your mouse in a clockwise or anti-clockwise direction, and then click to determine the angle of the pole. You do not have to indicate a rotation angle when you are placing a standard pole.

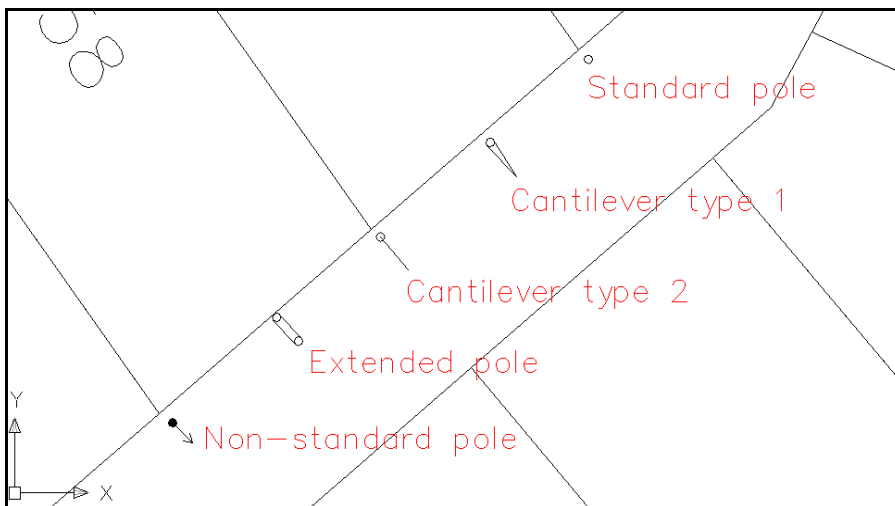


Figure 10 Traffic signal poles

Numbering traffic signal poles

- 1 Choose **Intersection > Number Poles**.
- 2 Select the pole that you want to number, as prompted by the command line.
Pole numbers increment with one value at a time.
- 3 Repeat **Step 2** to number the remaining poles.
- 4 Press **ESC** to exit the command.

Attaching signal faces to traffic signal poles

- 1 Choose **Intersection > Attach Signal Face...**
- 2 The **Signal Icons** dialog box is displayed.

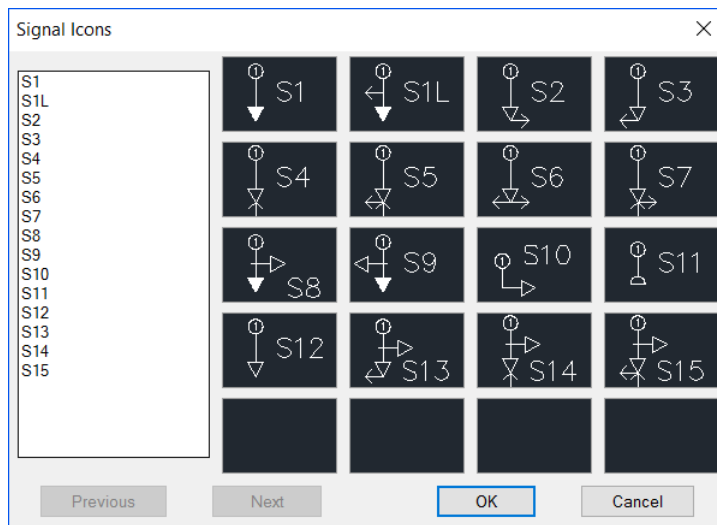


Figure 11 The Signal Icons dialog box

- 3 From the **Signal Icons** dialog box, select a signal face symbol, and then click **OK**.
- 4 Select the pole to attach the signal face to.
- 5 Rotate your mouse in a clockwise direction, and then click to position the signal face.
- 6 Indicate the text positions as prompted.
- 7 On the command line, type the phase numbers as prompted, and then press **ENTER**.
The signal faces are placed as indicated.

Displaying traffic signal legends

With this function, you can describe signal phases that are captured during the design of the intersection. Signal legends which describe signal phases are inserted as an AutoCAD block entity on the LEGENDS layer. The signal legend block can be customized to meet user requirements. This block is stored as *Signals.dwg* in the SYMBOLS folder of the Munsys install path.

To insert a signal legend

- 1 Choose **Extras > Insert Signal Legend**.
- 2 Indicate the legend position.

The legend is inserted as an AutoCAD block entity on the LEGENDS layer.

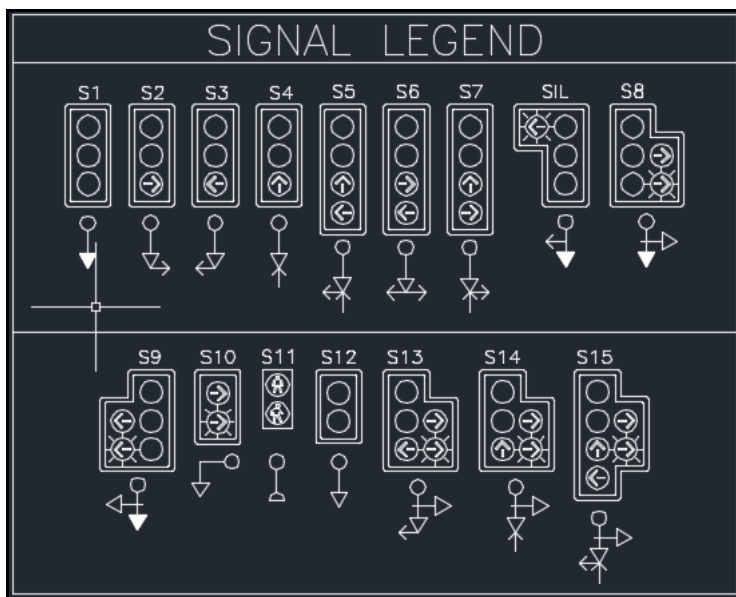


Figure 12 A signal legend

Displaying typical detail

With Munsys Roads, typical details are added to intersection drawings as AutoCAD Block entities and presented as schematics, at no specific scale. The detailed schematics indicate clearance distances and typical design details.

To add a typical detail schematic into an intersection drawing

- 1 Do one of the following:
 - Choose **Extras > Insert Typical detail > Standard Pole.**
 - Choose **Extras > Insert Typical detail > 1 Signal Extended.**
 - Choose **Extras > Insert Typical detail > 2 Signal Extended.**
 - Choose **Extras > Insert Typical detail > 1 Signal Cantilever.**
 - Choose **Extras > Insert Typical detail > 2 Signal Cantilever.**
 - Choose **Extras > Insert Typical detail > Type 1 Streetlight.**
 - Choose **Extras > Insert Typical detail > Type 2 Streetlight.**
 - Choose **Extras > Insert Typical detail > Type 3 Streetlight.**

The command line prompts you to indicate the cross section.

- 2 Position the mouse pointer, and then click.

The schematic is placed on the XSECTIONS layer.

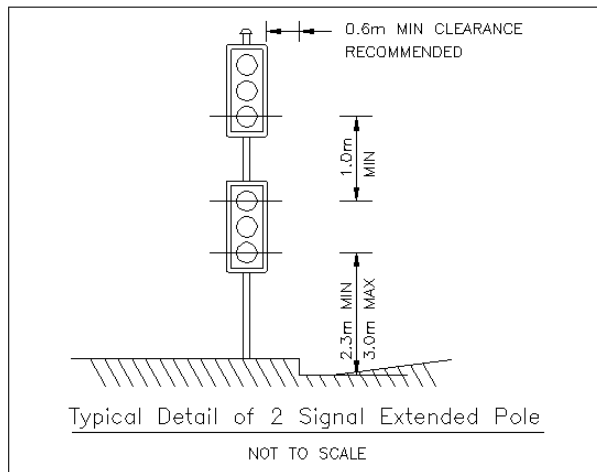


Figure 13 Extended pole schematic

Placing electricity objects in an intersection drawing

To place a distribution box

With this function, you can place an electricity distribution box and text in an intersection drawing.

- 1 Choose **Intersection > Place Objects > Distribution Box**.
- 2 Specify an insertion point for the distribution box.
- 3 Rotate your mouse in a clockwise or counter-clockwise direction, and then click to position the distribution box.
- 4 Specify a text insertion point.

The distribution box is placed on the ANNOTATION layer.

To place a controller

- 1 Choose **Intersection > Place Objects > Controller**.
- 2 Specify an insertion point for the controller.
- 3 Rotate your mouse in a clockwise or counter-clockwise direction, and then click to position the controller.
- 4 Specify the text position as prompted.

The controller is placed on the ANNOTATION layer.

To place a vehicle detector

- 1 Choose **Intersection > Place Objects > Vehicle Detector**.
- 2 Specify the first side of the road where you want to place the detector.
- 3 Specify the other side of the road where you want to place the detector.
- 4 Rotate your mouse in a clockwise or counter-clockwise direction, and then click to position the vehicle detector.

The vehicle detector is placed on the DETECTORS layer.

Tip A vehicle detector must be placed to form a diamond shape within the placed lanes.

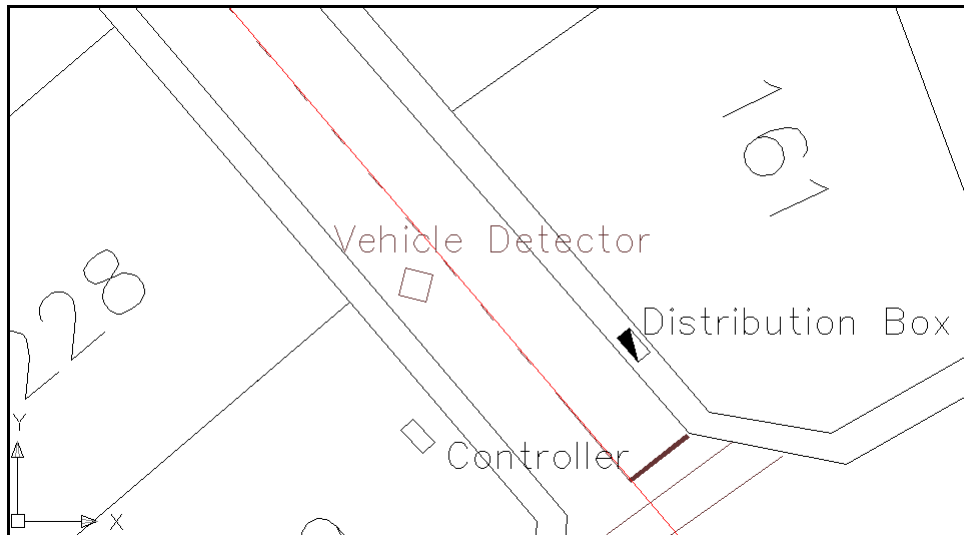


Figure 14 A controller, distribution box and vehicle detector

To place a cable junction

- 1 Choose **Intersection > Place Objects > Cable Junction**.
- 2 Specify an insertion point for the cable junction.
- 3 Rotate your mouse in a clockwise or counter-clockwise direction, and then click to position the cable junction.
- 4 The junction is placed on the **DETECTORS** layer.

Placing cables in an intersection drawing

To place a cable duct

Cable ducts indicate where detector cables and signal cables run under the road.

- 1 Choose **Intersection > Place Cables > Cable Ducts**.
- 2 Specify the first point on the road edge where you want to place the duct.
- 3 Specify a second point on the road edge at the opposite side of the road.
- 4 The cable duct is placed on the **SIGNAL_DUCTS** layer.

To place detector cables

- 1 Choose **Intersection > Place Cables > Detector Cables**.
- 2 Specify a first point for the cable.
- 3 Specify the next points, and then press **ENTER**.

The detector cables are placed on the **DETECTORS** layer.

To place signal cables

- 1 Choose **Intersection > Place Signal Cables**.
- 2 Select the start node for the cable, for example a distribution box.
- 3 Select the end node for the cable, for example a signal pole.
- 4 Specify the intermediate points for the cable to follow, and then press **ENTER**.

The cable is placed on the **SIGNAL_CABLES** layer.

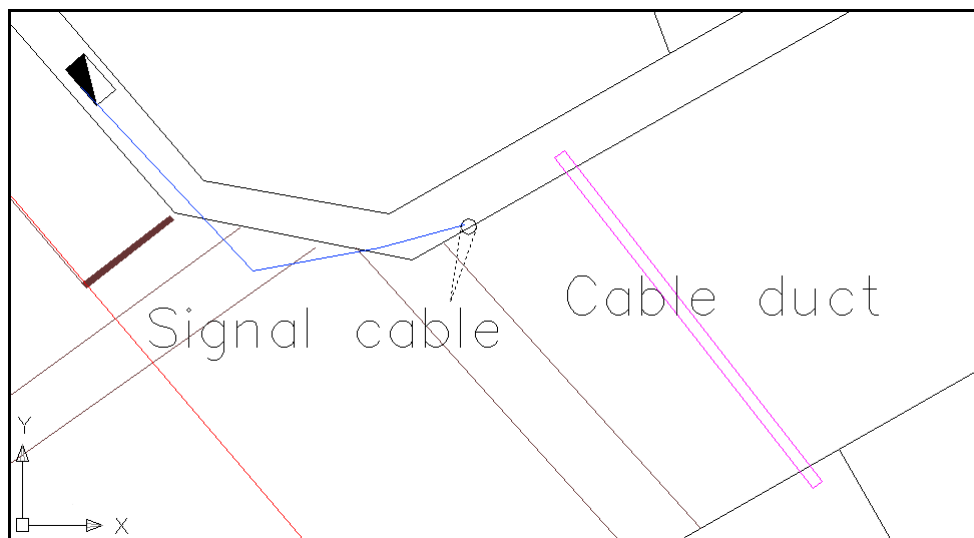


Figure 15 Cable ducts and signal cables

Placing road markings in an intersection drawing

With this function, you can place the following road markings in an intersection drawing:

- Straight Only, Left Only and Right Only
- Straight or Left
- Straight or Right
- Left or Right
- Yield

The road markings are selected from the Road Marking Icons dialog box by selecting the appropriate icon or its description. Road markings are created on the ROAD_MARKINGS layer.

To place road markings

- 1 Choose **Intersection > Place Road Marking...**
- 2 The **Road Marking Icons** dialog box is displayed.

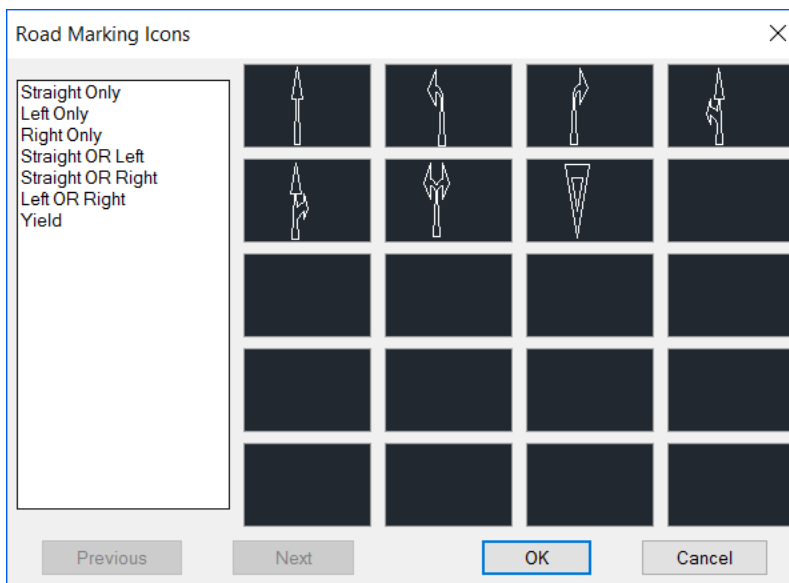


Figure 16 The Road Marking Icons dialog box

- 3 Select the road marking that you want to place by clicking on its description or image, and then click **OK**.
- 4 Specify the first side of the road.
- 5 Specify the second side of the road.
- 6 Rotate your mouse in a clockwise or counter-clockwise direction, and then click to set the direction of the road marking.

The road marking is placed as indicated.

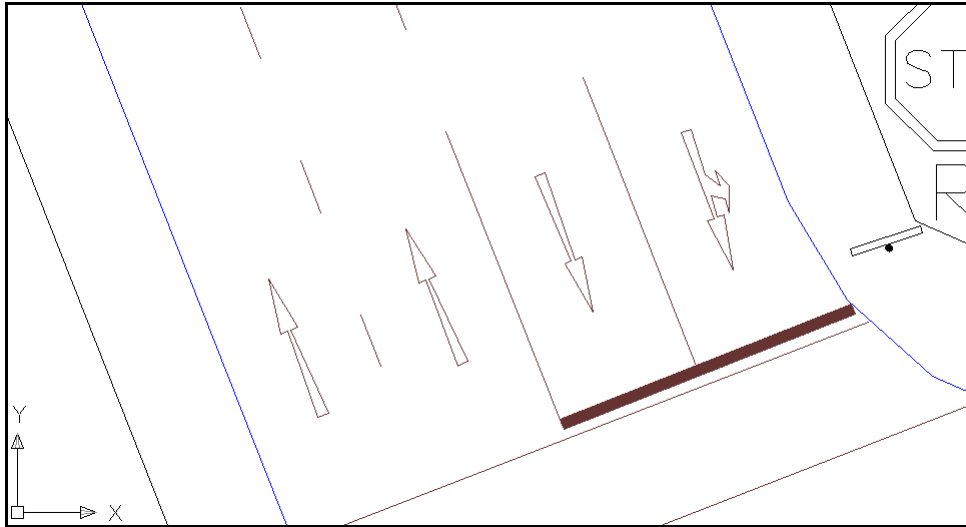


Figure 17 Road markings

Placing warnings signs in an intersection drawing

With this function, you can place the following warning signs in an intersection drawing:

- Stop ahead
- Yield
- Traffic light ahead
- Speed limit
- Keep left/right
- Sharp curve right/left
- Gentle curve right/left
- Side road junction left/right
- Staggered junction left/right

Warning signs are created on the SIGNS layer.

To place warning signs

1 Choose **Intersection > Place Warning Sign...**

The Signs dialog box is displayed.

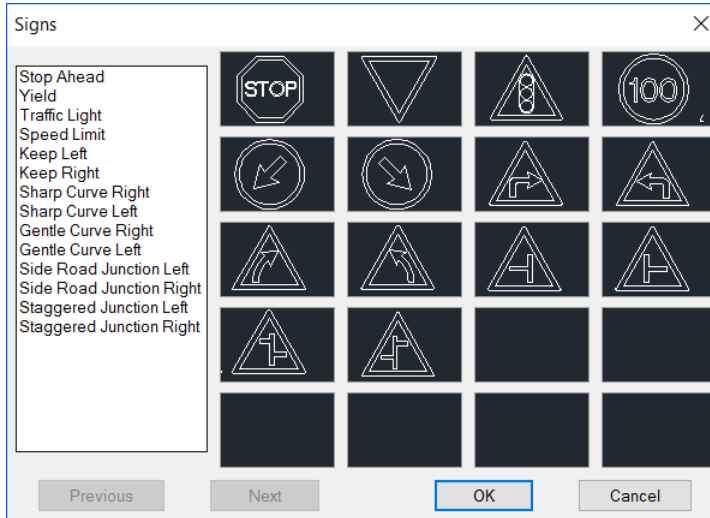


Figure 18 The Signs dialog box

- 2 Select the warning sign that you want to place by clicking on its description or image, and then click **OK**.
- 3 Specify the position of the signpost.
- 4 Rotate your mouse in a clockwise or counter-clockwise direction, and then click to position the sign in the direction of oncoming traffic.
- 5 Specify the position of the text close to the signpost, specify the position for the sign, and then specify the position of the text close to the sign.

The warning sign is placed as indicated.

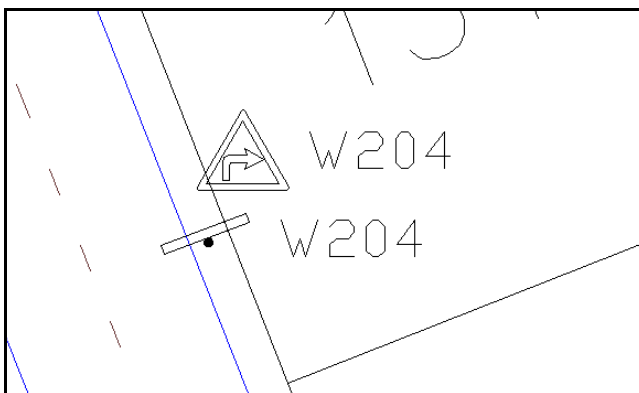


Figure 19 Sharp curve right

Saving a new intersection drawing

When creating a new intersection drawing, you will only be able to select an existing intersection marker to attach the drawing information to. When you save the new intersection drawing, the intersection marker is filtered out when the drawing entities are selected. A normal integrity check will be required on the intersection marker before the marker can be posted to the database. Intersection drawings are not saved to the database; only their associated intersection markers.

To save a new intersection drawing

- 1 Choose **Intersection > Save New Int Drawing...**
- 2 Select the appropriate road intersection marker.
- 3 Select all the entities that you want to save as an intersection drawing, and then press **ENTER**.

The Enter Marker Details dialog box is displayed.

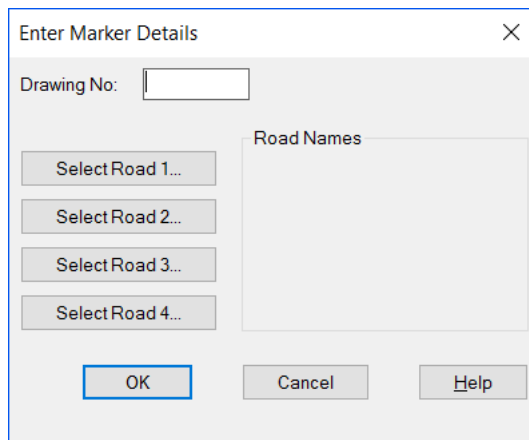


Figure 20 The Enter Marker Details dialog box

- 4 In the **Drawing No:** field, enter a drawing number.
- 5 Click the **Select Road 1** button.
- 6 From the list, select a road that is attached to the intersection marker.
- 7 Continue selecting roads until you have selected all the roads attached to the intersection marker, and then click **OK**.

Editing and saving an existing intersection drawing

When you want to make changes to an existing intersection drawing, you can retrieve the drawing by selecting its appropriate intersection marker. The changes made to the drawing are then saved by using the Save Existing Intersection drawing function.

To edit and save existing intersection drawing

- 1 Choose **Intersection > Edit Existing Int Drawing**.
- 2 Select the appropriate road intersection marker.
The intersection drawing is displayed in the AutoCAD drawing area.
- 3 Change the drawing according to your needs.
- 4 To save the changes to intersection drawing, choose **Intersection > Save Existing Int Drawing**.
The intersection drawing is saved.



Index

A

- adding comments 5- 86
- additional reading material 1- 2
- attribute toolbar 2- 11
- attributes, editing 5- 72

C

- cable duct, placing in intersection drawing 6- 105
- cable junction, placing 6- 104
- capture settings
 - specifying 4- 27
- capture settings 4- 26
- capture toolbar 2- 9
- change toolbar 2- 10
- channel lines
 - setting urban and rural 6- 95
- channel lines 6- 95
- construction line toolbar 2- 8
- construction lines
 - breaking 4- 30
 - changing 4- 30
 - constructing 4- 28
 - drawing freehand 4- 29
 - drawing offset 4- 29
 - extending 4- 31
 - extending and breaking 4- 32
 - filleting 4- 31
 - trimming 4- 32
- construction lines 4- 28
- controller, placing 6- 103
- converting block entities to road intersection markers 4- 63
- converting line entities to road objects 4- 64

- converting text to road note 4- 64

D

- database
 - posting road data to 4- 57
- database, connecting to 2- 5
- deleting road objects 5- 87
- detector cables, placing 6- 105
- direction arrows, clearing 4- 38
- direction toolbar 2- 9
- distribution box, placing 6- 103
- dividing lines 6- 96

E

- electricity objects, placing in intersection drawing 6- 103

G

- guard rails
 - placing 6- 98
 - placing poles 6- 97
- guard rails 6- 97

I

- insert intersection toolbar 2- 10
- integrating object integrity and posting 4- 59
- integrity check
 - integrity markers 4- 56
- integrity check 4- 51
- integrity markers, browsing 4- 56
- integrity markers, erasing 4- 57
- integrity markers, locating errors 4- 56
- intersection drawings

- creating 6- 89
- editing and saving existing 6- 110
- saving new 6- 109

- intersection markers
 - inserting nearest 4- 43
 - moving 5- 71
 - placing 4- 42
 - placing endpoint 4- 42

- intersection markers 2- 12

- islands

- drawing painted 6- 97
 - inserting hatch islands 6- 97

- islands 6- 97

L

- lanes

- constructing 6- 94

- lanes 6- 94

- linked table attributes, editing 5- 75

M

- Munsys Roads

- interface 2- 7

- launching 2- 5, 6

- Munsys Roads 2- 4

P

- pedestrian crossings

- drawing aligned 6- 92

- drawing freehand 6- 93

- drawing offset 6- 92

- pedestrian crossings 6- 92

- place intersection toolbar 2- 10

Q

- queries

- querying all road objects 3- 15

- querying road center lines by GSC 3- 16

- querying road center lines by road name 3- 17

- querying road edges 3- 21

- querying road intersection drawings 3- 23

- querying road intersection markers by GSC 3- 18

- querying road intersection markers by road name 3- 19

- querying road notes 3- 24

- queries 3- 14

R

- road areas

- capturing 4- 44

- drawing boundaries 4- 44

- drawing polygon 4- 44

- generating polygons 4- 45

- querying 3- 20

- road areas 2- 13

- road capture settings 4- 26

- road center lines

- attaching a road name 4- 40

- attaching a route number 4- 41

- changing direction 4- 36

- constructing 4- 33

- drawing freehand 4- 33

- drawing offset 4- 33

- generating 4- 34

- querying by gsc 3- 16

- querying by road name 3- 17

- showing direction 4- 35

- road center lines 2- 12

- road classification, changing 5- 79

- road data, modifying 5- 65

- road edges

- capturing 4- 46

- changing type 5- 84

- drawing freehand 4- 47

- drawing offset 4- 46

- querying 3- 21

- road edges 2- 13

- road integrity

- browsing integrity markers 4- 56

- checking network integrity 4- 55

- checking object integrity 4- 54
- erasing integrity markers 4- 57
- road integrity 4- 51
- road intersection
 - resyncing road names 5- 84
- road intersection center lines
 - drawing 6- 89
 - rounding off 6- 89
- road intersection center lines 6- 89
- road intersection edges
 - rounding off 6- 90
- road intersection edges 6- 90
- road intersection markers
 - querying by GSC 3- 18
 - querying by road name 3- 19
- road intersections
 - querying drawings 3- 23
- road jurisdiction
 - changing 5- 80
- road markings, placing 6- 106
- road names
 - adding a new road name to the list 4- 39
 - changing 5- 76
- road names 4- 39
- road network
 - capturing 4- 25
- road network 2- 13
- road notes
 - changing 5- 85
 - placing 4- 50
 - querying 3- 24
- road notes 4- 50
- road objects
 - about 2- 12
 - breaking 5- 67
 - changing 5- 66, 68
 - changing vertex 5- 70
 - extending and breaking 5- 67
 - extending by distance 5- 66
 - extending to a boundary 5- 66
 - filleting 5- 68

- joining 5- 69
- trimming 5- 69
- road objects 2- 12
- road owner
 - changing 5- 81
- road surface type
 - changing 5- 83
- road type, changing 5- 82
- road width, changing 5- 78
- roads data status report, generating 4- 62
- roads network quality reporting 4- 60
- roads settings dialog box 4- 27
- route numbers
 - adding a new route number to the list 4- 39
 - changing 5- 77
- route numbers 4- 39

S

- signal cables, placing 6- 105
- stop lines
 - drawing aligned 6- 91
 - drawing freehand 6- 91
 - drawing offset 6- 91
- stop lines 6- 91

T

- traffic direction, changing 4- 38
- traffic direction, showing 4- 36
- traffic signal legends, inserting 6- 101
- traffic signals
 - attaching signal faces 6- 100
 - numbering poles 6- 100
 - placing poles 6- 99
- traffic signals 6- 99
- typical detail, adding schematics 6- 102

U

- undeleting road objects 5- 87

V

- vehicle detector, placing 6- 103

W

walkways

capturing 4- 48

constructing 4- 48

drawing freehand 4- 49

drawing offset 4- 48

querying 3- 22

walkways 2- 13

warnings signs, placing 6- 107