Munsys 14

ELECTRICITY USER MANUAL

Munsys® Electricity User Manual

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Contents

Chapter 1 Introducing the Munsys Electricity User Manual

Welcome to Munsys Electricity 1
About this 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 Electricity

About Munsys Electricity 4
Launching Munsys and Munsys Electricity 5
Connecting to the Oracle database 5
The Munsys Electricity interface 7
About electricity objects 14

Chapter 3 Querying electricity data from the database

Introduction 16
Querying all electricity objects 17
Querying electricity objects by category 19
Querying electricity network objects 20
Querying additional electricity objects 23

Chapter 4 Creating electricity data

Introduction 25
Capturing electricity data 26
Electricity capture settings 27
Capturing electricity nodes 29
Node capture settings 30
Placing electricity nodes 30
Inserting electricity nodes into an existing network 31
Capturing electricity cables 32
Capturing overhead electricity cables 33
Placing underground electricity cables 34
Capturing service connections 37
Placing overhead service connections 38
Placing underground service connections 39
Checking electricity cable direction 44
Capturing ducts 46

Capturing electricity attribute data 47
Attaching a node reference 47
Placing an electricity note 48
Capturing electricity dimensions 49
Capturing electricity zones 50
Checking electricity integrity 52
Checking electricity object integrity 55
Checking electricity network integrity 56
Browsing integrity markers 57
Erasing integrity markers 58
Posting electricity data to the database 58
Validating object integrity and posting data at the same time 60
Electricity network quality reporting 61
Generating electricity data status reports 63
Converting AutoCAD entities to electricity objects 65

Chapter 5 Maintaining electricity data

Modifying electricity data 66
Editing attributes 67
Editing linked table attributes 71
Changing electricity nodes 72
Changing electricity cables 74
Changing service connections 77
Changing electricity notes 80
Adding comments 81
Deleting and undeleting electricity objects 82

Chapter 1
Introducing the Munsys Electricity User Manual

Welcome to Munsys Electricity

Munsys Electricity is used to capture and maintain electricity ring and radial 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 Electricity 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 this manual

The *Munsys Electricity User Manual* enables users to easily find their way around Munsys Electricity, and provides a conceptual overview of the functionality used in Munsys Electricity. 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 Electricity User Manual* consists of the following chapters:

- Chapter 1 – Introducing the Munsys Electricity User Manual, gives an overview of this manual, and provides links to additional reading material.
- Chapter 2 – Getting acquainted with Munsys Electricity, gives an overview of Munsys Electricity and its various components.
- Chapter 3 – Querying electricity data from the database, describes how to query electricity data from the database.
- Chapter 4 – Creating electricity data, shows the user how to capture a electricity network, add additional electricity objects, and post electricity data to the database.
- Chapter 5 – Maintaining electricity data, describes how to maintain existing electricity data.

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
- how to view spatial data
- 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 Electricity
Dialog box/screen names	The Electricity 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 Electricity

About Munsys Electricity

Munsys Electricity caters for the easy capture and maintenance of electricity ring and radial networks. Munsys provides the necessary Electricity toolbars, ordered the way the capture process requires. The capture functionality supports networks of Extra High Voltage, High Voltage, Low Voltage and street lights, as well as the capture of service connections and electricity zones.

The electricity network is complete once the electricity cables, nodes, and service connections have been captured. Network connectivity and integrity rules are applied as the cables are attached to the nodes. These rules prevent incorrect connectivity between nodes and cables across different networks.

Munsys Electricity allows data retrieval from the database by category, geographic location or user-specific criteria.

Launching Munsys and Munsys Electricity

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 Electricity. 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.

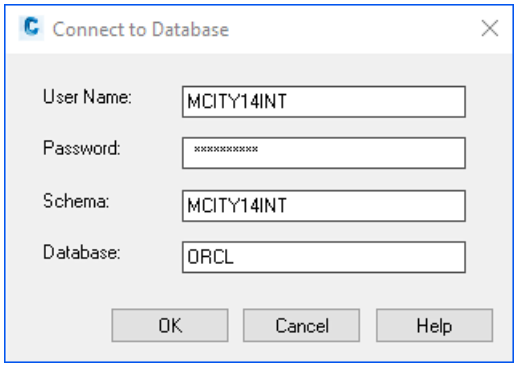


Figure 1 The Connect to Database dialog box

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 what your user name, password, schema name, and database name are.

To launch Munsys Electricity

When you launch Munsys for the first time, the configured base map automatically loads and the Munsys Electricity 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 Electricity, do the following:

- Choose **File** > **Munsys Applications**.
- Click the **Munsys Applications** button on the Munsys standard toolbar.

The Available Applications dialog box is displayed.

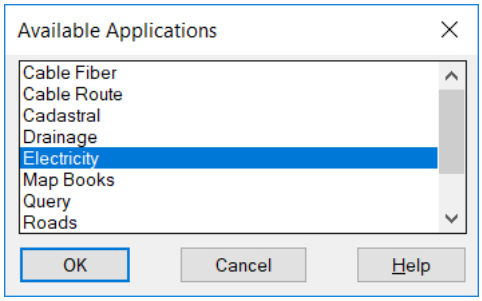


Figure 2 The Available Applications dialog box

2 From the list of available applications, select **Electricity,** and then click **OK**.

The Munsys Electricity menus and toolbars are loaded.

The Munsys Electricity interface

The Munsys Electricity interface consists of the following:

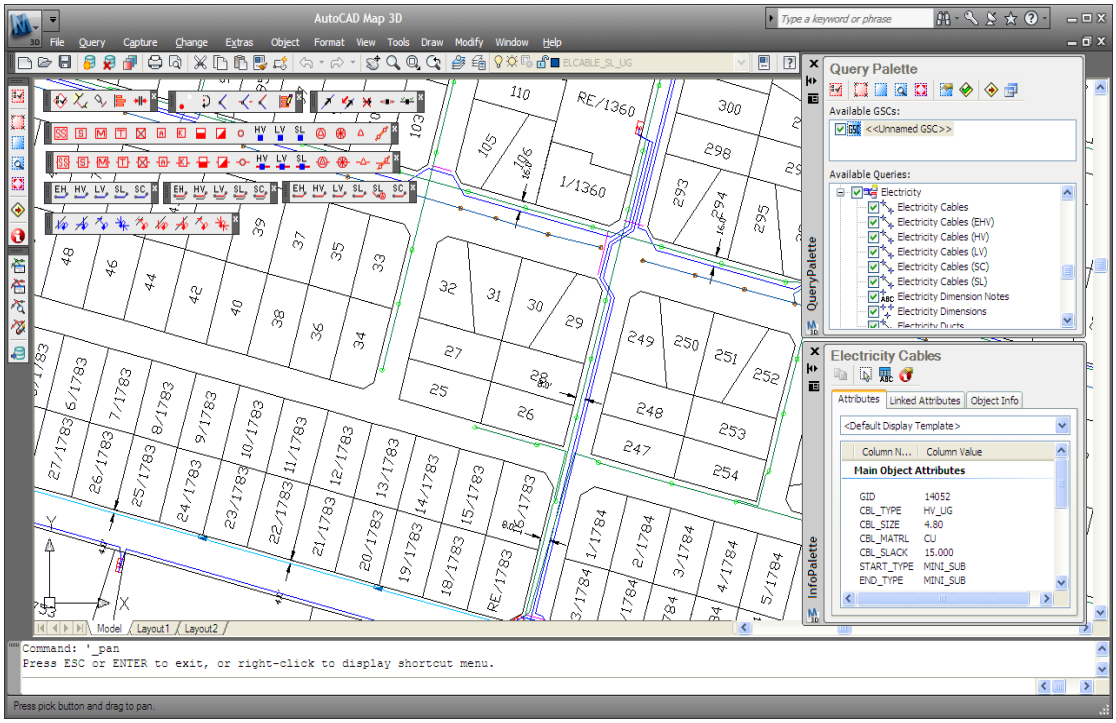


Figure 3 The Munsys Electricity interface

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.

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.

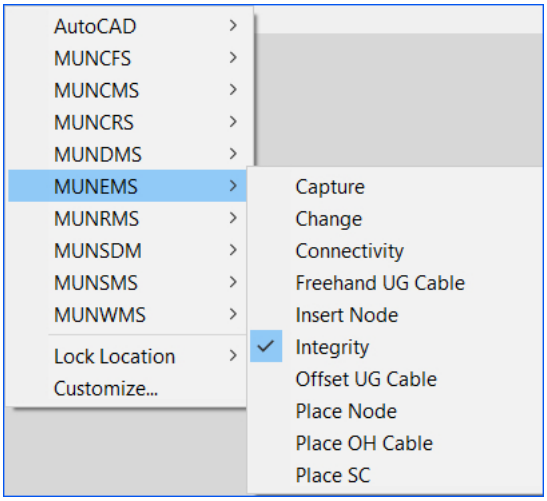
Munsys main toolbar – contains frequently used Munsys functions.

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

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

Table 4 The Munsys Electricity Integrity Toolbar

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



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

- The Munsys Electricity Capture toolbar contains the following buttons:

Use this button	When you want to...
	...specify electricity capture settings.
	...place a duct.
	...attach a node reference.

Use this button	When you want to...
	...place an electricity note.
	...place dimension arrows.

Table 5 The Munsys Electricity Capture toolbar

- The Munsys Electricity Change toolbar contains the following buttons:

Use this button	When you want to...
	...move an electricity node.
	...rotate a node by 180 degrees.
	...change the vertex of an electricity cable
	...insert a new vertex into an electricity cable.
	...add a new vertex to an electricity cable.
	...change an electricity note.

Table 6 The Munsys Electricity Change toolbar

- The Munsys Electricity Place Node toolbar contains the following buttons:

Use this button	When you want to...
	...place a switch station.
	...place a standard sub.
	...place a mini sub.
	...place a transformer.
	...place a pylon.
	...place an air link.
	...place a kiosk.
	...place an HV switch.

Use this button	When you want to...
	...place a distribution box.
	...place a pole.
	...place an HV junction.
	...place an LV junction.
	...place a street light junction.
	...place a street light pole.
	...place a high mast street light.
	...place a street light.
	...place a billboard.

Table 7 The Munsys Electricity Place Node toolbar

- The Munsys Electricity Insert Node toolbar contains the following buttons:

Use this button	When you want to...
	...insert a switch station.
	...insert a standard sub.
	...insert a mini sub.
	...insert a transformer.
	...insert a pylon.
	...insert an air link.
	...insert a kiosk.
	...insert an HV switch.
	...insert a distribution box.

Use this button	When you want to...
	...insert a pole.
	...insert an HV junction.
	...insert an LV junction.
	...insert a street light junction.
	...insert a street light pole.
	...insert a high mast street light.
	...insert a street light.
	...insert a billboard.

Table 8 The Munsys Electricity Insert Node toolbar

- The Munsys Electricity Place OH Cable toolbar contains the following buttons:

Use this button	When you want to...
	...place an overhead EHV cable.
	...place an overhead HV cable.
	...place an overhead LV cable.
	...place an overhead SL cable.
	...place an overhead SC cable.

Table 9 The Munsys Electricity Place OH Cable toolbar

- The Munsys Electricity Place Offset UG Cable toolbar contains the following buttons:

Use this button	When you want to...
	...place an offset underground EHV cable.
	...place an offset underground HV cable.
	...place an offset underground LV cable.

Use this button	When you want to...
	...place an offset underground SL cable.
	...place an offset underground SC cable.

Table 10 The Munsys Electricity Place Offset UG Cable toolbar

- The Munsys Electricity Place Freehand UG Cable toolbar contains the following buttons:

Use this button	When you want to...
	...place a freehand underground EHV cable.
	...place a freehand underground HV cable.
	...place a freehand underground LV cable.
	...place a freehand underground SL cable.
	...place a freehand underground SL cable by pole.
	...place a freehand underground SC cable.

Table 11 The Munsys Electricity Place Freehand UG Cable toolbar

- The Munsys Electricity Place SC toolbar contains the following buttons:

Use this button	When you want to...
	...place a freehand OH service connection.
	...place a direct OH service connection at 45 degrees.
	...place a direct OH service connection at 90degrees.
	...place a radial OH service connection
	...place an offset UG service connection
	...place a freehand UG service connection.
	...place a direct UG service connection at 45 degrees.
	...place a direct UG service connection at 90degrees.

Use this button	When you want to...
	...place a radial UG service connection

Table 12 The Munsys Electricity Place SC toolbar

- The Munsys Electricity Connectivity toolbar contains the following buttons:

Use this button	When you want to...
	...show cable direction.
	...change cable direction.
	...clear direction arrows.
	...reset node connectivity.
	...reconnect cable connectivity.

Table 13 The Munsys Electricity Connectivity toolbar

About electricity objects

Electricity nodes, cables, and service connections are the electricity objects that are used to build networks. The initial connection from a parcel to the rest of the electricity network is called a service connection.

An electricity network contains the following electricity nodes:

- Kiosks – used to connect HV cables to underground cables.
- HV switches – used to connect HV cables to either overhead or underground cables.
- Distribution boxes – used to connect service connections and street lights.
- LV junctions – used to connect multiple LV cables.
- High mast street lights – used with street light cables.
- Street light poles – used with street light cables.
- Street lights – used in combination with poles and street light cables.
- Billboards – used with street light cables.
- Street light junctions – used to connect multiple street light cables.
- Pylons – used to distribute overhead EHV. Pylons are not part of the network if used as intermediate nodes.
- Poles – used to distribute overhead HV, LV, SL, and service connection cables. Poles are not part of the network if used as intermediate nodes.

Munsys Electricity caters for the capture of the following electricity cables:

- OH EHV – Extra High Voltage overhead cable
- UG EHV – Extra High Voltage underground cable
- OH HV – High Voltage overhead cable
- UG HV – High Voltage underground cable
- OH LV – Low Voltage overhead cable
- UG LV – Low Voltage underground cable
- OH SL – Street Light overhead cable
- UG SL – Street Light underground cable
- OH SC – Service Connection overhead cable
- UG SC – Service Connection underground cable

Electricity notes are used to supply additional information on plans and drawings.

Dimensions also supply additional information in terms of the location of an electricity object relative to a parcel boundary.

Electricity zones are drawn as polygons, and usually indicate a certain transformer supply area.

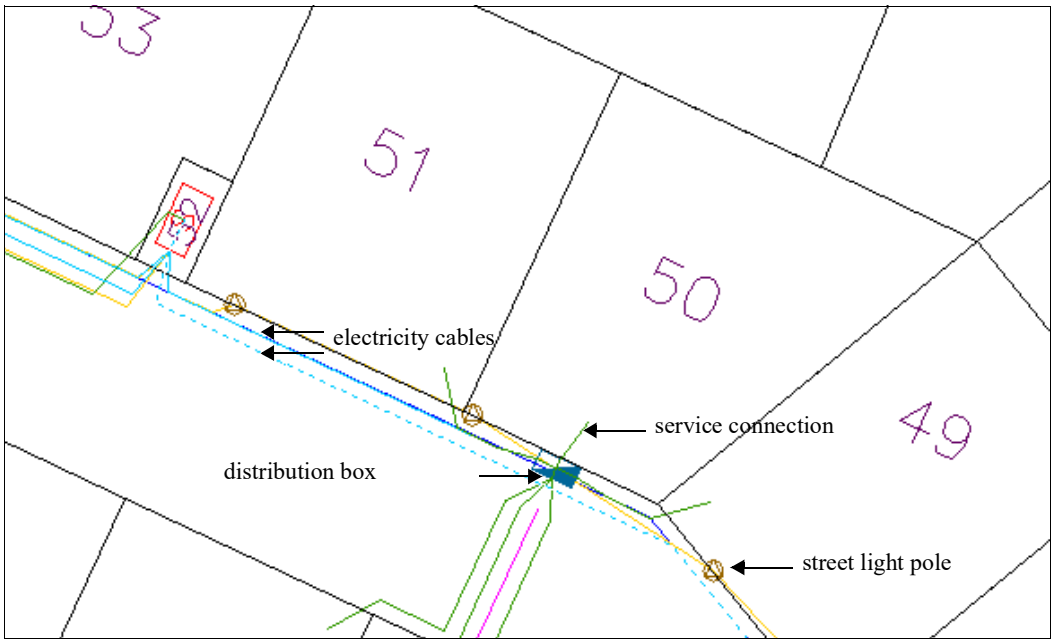


Figure 14 Electricity objects

Chapter 3
Querying electricity data from the database

Introduction

This chapter describes how to retrieve electricity data of your choice from the database using the Query menu. You can also use the Munsys Query Palette to assist in retrieving electricity 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*. All users accessing the database have query privileges, although all users do not have the privilege to update the spatial tables in the database.

Electricity nodes, cables and service connections are the electricity objects that contribute to an electricity ring or radial network. Additional electricity objects include electricity zones, ducts, notes and dimensions.

With Munsys Electricity, you can either query all the electricity objects from the database, query electricity objects by category [Extra High Voltage (EHV), High Voltage (HV), Low Voltage (LV), Service Connection (SC) or Street Light (SL)], query only electricity network objects (nodes, cables and service connections) or query individual electricity objects (electricity zones, ducts, notes and dimensions). The Munsys Electricity base data is stored in a central database.

When electricity data is queried, it includes the retrieval of the spatial objects, with a link to the attribute data in the database.

Querying all electricity objects

With this query, you can retrieve all the electricity objects according to the current GSC from the electricity tables in the database. The queried electricity objects are formatted according to their system query settings. Each object type is retrieved onto its own layer, for example an overhead EHV cable will be retrieved onto the ELCABLE_EH_OH layer, a transformer will be retrieved onto the ELNODE_TRANSFORMER layer, and an overhead service connection will be retrieved onto the ELSERV_SC_OH layer. The layers can be changed to display different line types or colors, using the standard properties functions.

The Query All function queries the following electricity objects:

Electricity object	Layer	Munsys object type
Cables	ELCABLE_*CABLE_TYPE**	MunLine
Nodes	ELNODE_*TYPE*	MunPoint
Ducts	ELDUCT	MunLine
Electricity Zones	ELZONE	MunPoly
Notes	ELNOTE	MunLabel
Dimensions	ELDIM	MunPoint
Dimension notes	ELNOTE_DIM	MunLabel
Service connections	ELSERV_*TYPE*	MunLine

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

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

The electricity objects are displayed, and the command line indicates how many electricity nodes, cables, ducts, service connections, notes, dimensions and electricity zones respectively were retrieved from the database.

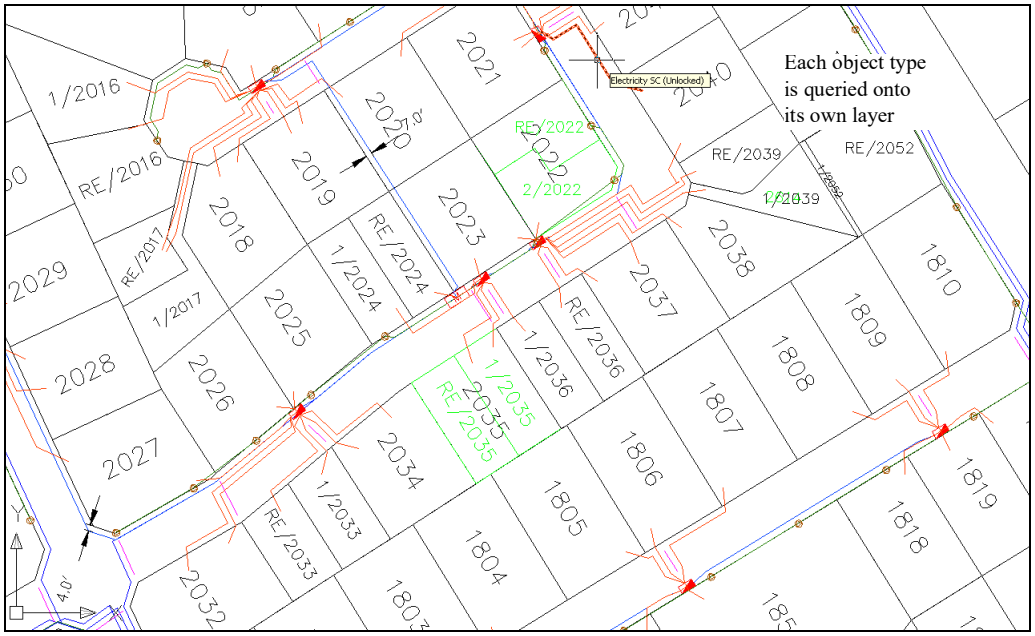


Figure 1 Query all electricity objects

Querying electricity objects by category

With this query, you can retrieve electricity nodes and cables per category (EHV, HV, LV, SL and SC) according to the current GSC, from the electricity tables in the database.

To query by electricity category, do one of the following:

1 Choose **Query** > **Electricity Categories** > **EHV**.

The electricity objects are displayed, and the command line indicates how many extra high voltage nodes and cables respectively were retrieved from the database.

2 Choose **Query** > **Electricity Categories** > **HV**.

The electricity objects are displayed, and the command line indicates how many high voltage nodes and cables respectively were retrieved from the database.

3 Choose **Query** > **Electricity Categories** > **LV**.

The electricity objects are displayed, and the command line indicates how many low voltage nodes and cables respectively were retrieved from the database.

4 Choose **Query** > **Electricity Categories** > **SL**.

The electricity objects are displayed, and the command line indicates how many street light nodes and cables respectively were retrieved from the database.

5 Choose **Query** > **Electricity Categories** > **SC**.

The electricity objects are displayed, and the command line indicates how many service connections were retrieved from the database.

Querying electricity network objects

To query electricity nodes

This query retrieves all the electricity nodes that form part of the electricity network onto their respective layers, according to the current GSC. The nodes are formatted according to their system query settings, which are determined by the database administrator. Electricity nodes are retrieved as MunPoint objects.

To query electricity nodes, do the following:

- Choose **Query** > **Electricity Network** > **Nodes**.

The command line indicates how many electricity nodes were retrieved from the database.

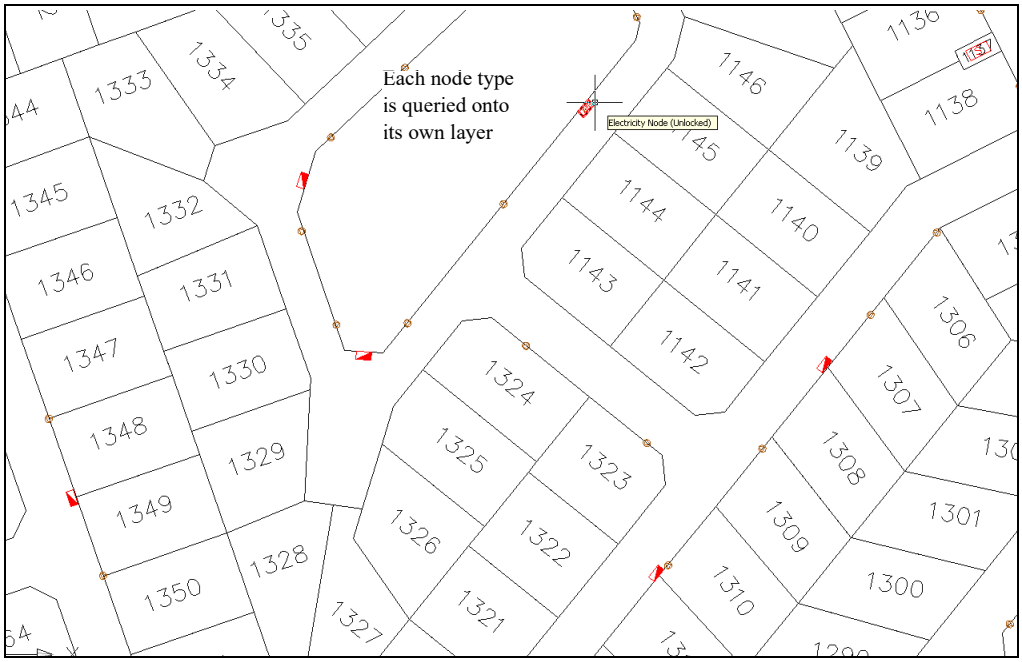


Figure 2 Query electricity nodes

To query electricity cables

This query retrieves all the electricity cables that form part of the electricity network onto their respective layers, according to the current GSC. Electricity cables are retrieved as MunLine objects.

To query electricity cables, do the following:

- Choose **Query** > **Electricity Network** > **Cables**.

The command line indicates how many electricity cables were retrieved from the database.

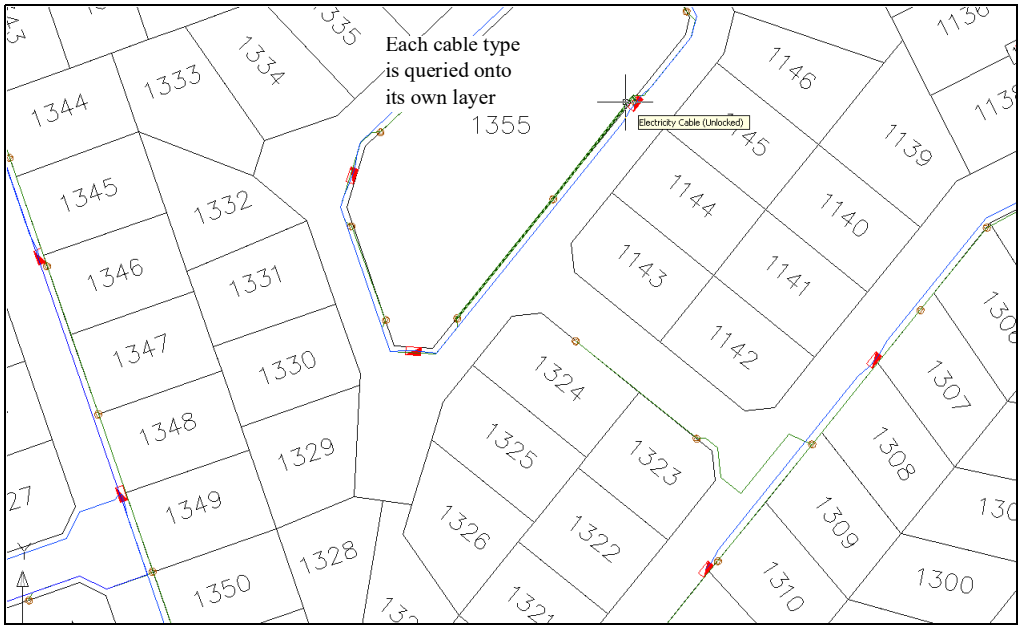


Figure 3 Query electricity cables

To query electricity service connections

This query retrieves electricity service connections onto the ELSERV layer according to their system settings, in order to indicate the connection from the parcel to the rest of the electricity network.

To query service connections, do the following:

- Choose **Query** > **Electricity Network** > **SCs**.

The command line indicates how many service connections were retrieved from the database.

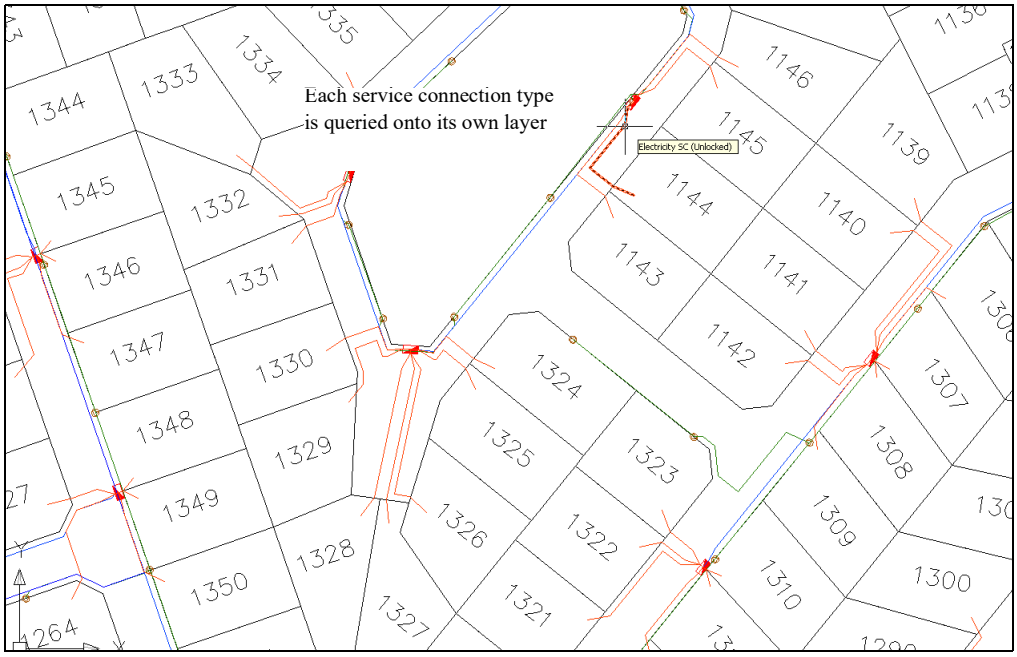


Figure 4 Query service connections

Querying additional electricity objects

To query electricity zones

Electricity zones are retrieved to view different parts of the electricity network. Electricity zones are retrieved according to the current GSC onto the ELZONE layer.

- Choose **Query** > **Electricity Objects** > **Electricity Zones**.

The command line indicates how many electricity zones were retrieved from the database.

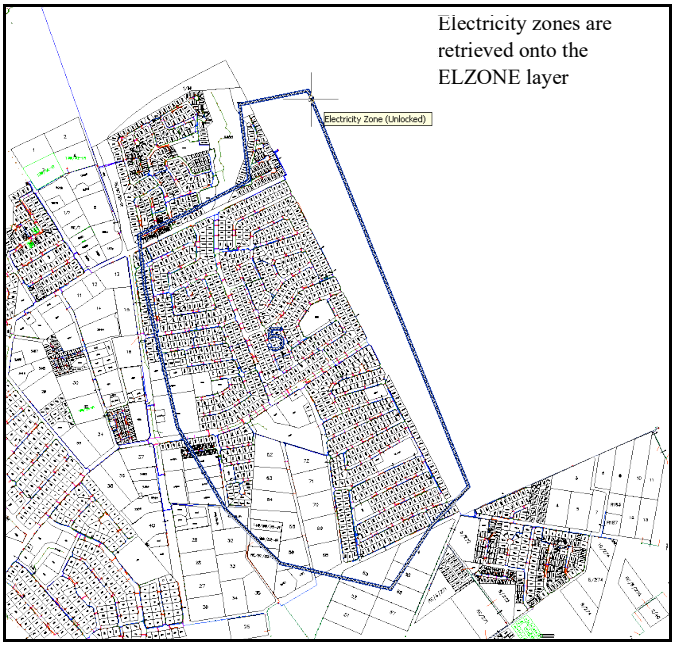


Figure 5 Query electricity zones

To query ducts

This query retrieves electricity ducts onto the ELDUCT layer, according to the current GSC.

- Choose **Query** > **Electricity Objects** > **Ducts**.

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

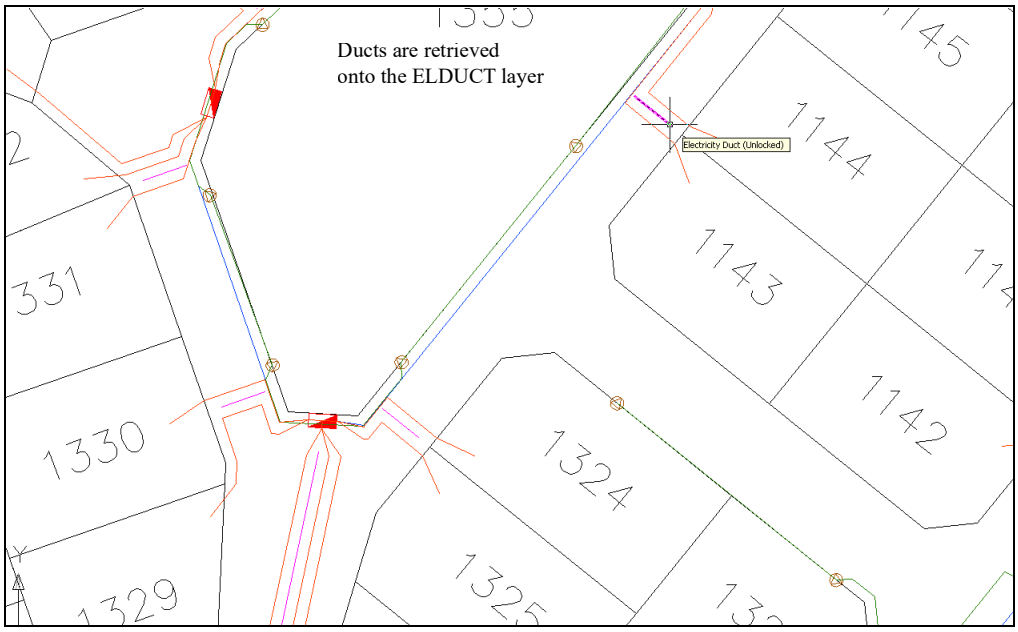


Figure 6 Query ducts

To query electricity notes

This query retrieves all the electricity notes according to the current GSC. Electricity notes supply additional information on plans and drawings.

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

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

To query electricity dimensions

This query retrieves all the electricity dimensions from the database according to the current GSC. Dimensions supply additional information in terms of the location of an electricity object.

To query electricity dimensions, do the following:

- Choose **Query** > **Electricity Objects** > **Dimensions**.

The command line indicates how many electricity dimensions were retrieved from the database.

Chapter 4
Creating electricity data

Introduction

An electricity network is built as a ring or radial network, using interrelated electricity objects. This network consists of smaller networks of Extra High Voltage (EHV), High Voltage (HV), Low Voltage (LV), Street Lights (SL) and Service Connections (SC).

The rules that apply to electricity nodes and cables are built in to the capture routines. These rules prevent incorrect connectivity between nodes and cables across the different networks.

Once the electricity nodes, cables and service connections have been captured, they can be posted to the database, once an integrity check has been run.

Capturing electricity data

Before you start capturing an electricity network, you first need to query the relevant cadastral data from the database to make certain that the electricity objects will locate geographically correct. Existing electricity objects should also be queried to determine the relationship between existing and new objects. This will prevent data duplication.

When capturing electricity networks, electricity nodes need to be captured first. Each node belongs to a node group for querying all objects by HV or LV, etc. The node group consists of a series of flag fields that indicate whether they belong to a certain group or not. (For example, a switch station node belongs to the EHV and HV groups, and is flagged as such).

Next, electricity cables are attached to the nodes. Electricity cables can only be attached to nodes of the same category (for example, EHV overhead switch feeders are attached to pylons).

Cable lengths are calculated along the boundaries and adjusted for slack at each connecting node. The user attaches attribute information such as connect status, type and size for electricity objects.

Service connections, which indicate the connection from the parcel to the rest of the electricity network, are captured next.

Electricity objects need to be checked against the applicable business rules before they are posted to the database. The integrity check checks the specific electricity network.

Electricity capture settings

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

In Munsys Electricity, default settings are available for:

- cables – tie-in distance for nodes, tolerance, default offset distance, street light cable size, cable material, prompt for cable information when capturing cables, etc.
- dimensions – the dimension tag height
- ducts – trim or extend when placed
- electricity zones – the zone tag height
- 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 – cable, node, service connection and search tolerance
- electricity nodes – cable slack for nodes, insertion scale, node symbol offset distance, node tolerance, alignment of nodes with cadastral boundaries, automatic node placement, etc.
- electricity notes – the note tag height
- service connections – service connection length and prompt for service connection info during capture.

You can change the current settings on the Electricity Settings dialog box to speed up the capture process. Capture settings only apply to *new* electricity 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.

Tip A short description of a value displays when it is highlighted.

To specify electricity capture settings

1 Do one of the following:

- Choose **Capture** > **Electricity Settings...**
- Click the **Electricity Settings...** button on the Munsys Electricity **Capture** toolbar.

The Electricity Settings dialog box is displayed, showing the default electricity capture settings.

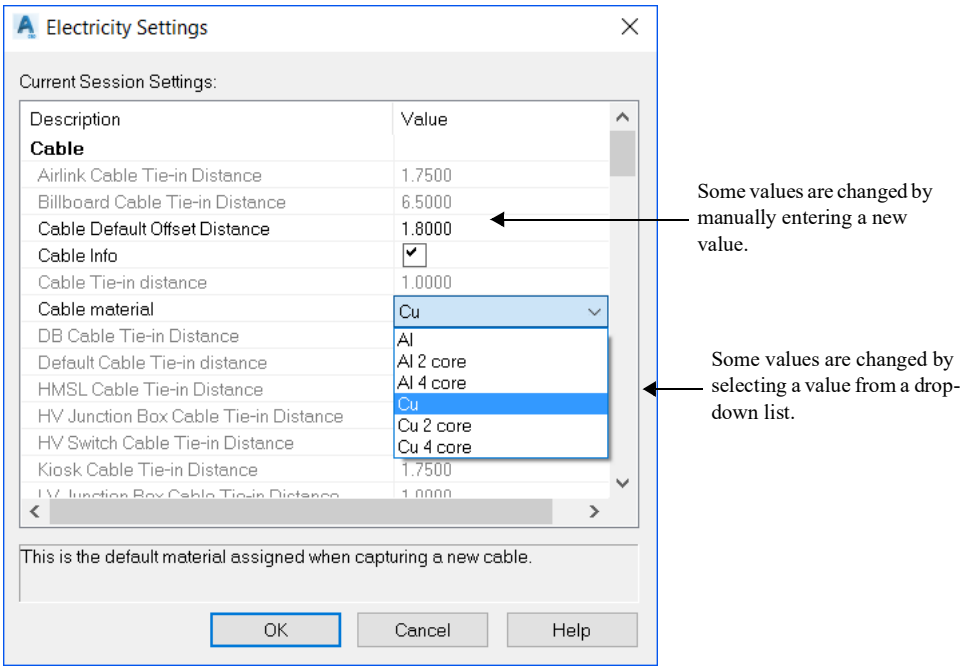


Figure 1 The Electricity Settings dialog box

2 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.

3 Click **OK** to apply the new settings.

The settings will apply until you change them again, or until the current session is terminated.

Capturing electricity nodes

Electricity nodes are captured first when the electricity network is created. Nodes are captured onto their appropriate layers, to be verified when the integrity check is run. With Munsys Electricity, you can capture the following electricity nodes:

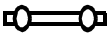
Node	Icon	Description
Switch station		A switch station is the main node where the HV network starts.
Standard sub		A standard sub is one of the nodes where the LV network starts.
Mini sub		A mini sub is one of the nodes where the LV network starts.
Transformer		A transformer is one of the nodes where the LV network starts.
Pylon		A pylon is used to distribute overhead EHV. Pylons typically form intermediate nodes that are not connected to the network.
Air link		An air link is used to connect HV cables on overhead lines.
Kiosk		A kiosk is used to connect HV cables on underground cables.
HV switch		An HV switch is used to connect HV cables on either overhead or underground cables.
Distribution box		A distribution box is used to connect service connections and street lights.
Pole		Poles are used to distribute overhead HV, LV, SL, and service cables, and usually form intermediate nodes that are not connected to the network.
Junction (HV, LV & SL)		Junctions are used to connect multiple cables. Junctions can be HV, LV or SL. The layer color is set to distinguish between junction types.
High mast SL		A high mast street light is used with SL cables.
Street light poles		A street light pole is used with street light cables.
Street light		A street light is used in combination with poles and street light cables.
Billboard		A billboard is used with street light cables.

Table 2 Electricity nodes

Node capture settings

The following node settings on the Electricity Settings dialog box determine the procedure that is followed when nodes are placed:

- Align nodes with cadastral – determines whether or not a node is automatically aligned with cadastral boundaries when it is captured.
- Automatic node placement – determines whether nodes are placed automatically or not; when this setting is enabled, you will not be prompted for an insertion point.
- Node descriptions – prompts for a description when a node is captured.
- Snap nodes – determines whether a node is automatically snapped to cadastral boundaries when it is captured.

Placing electricity nodes

Using the default capture settings, electricity nodes are placed as follows:

To place an electricity node

1 Do one of the following:

- Choose **Capture** > **Place Node** > *Node Name*.
- Click the appropriate button on the Munsys Electricity **Place Node** toolbar.

2 Select the segment to snap the node to.

3 Specify the insertion point for the node.

4 Specify on which side of the segment to place the node.

The node is captured on its appropriate layer, to be verified when the integrity check is run.

Inserting electricity nodes into an existing network

With Munsys, you can insert electricity nodes into an existing electricity network, without having to recapture the nodes and cables. The underlying cable is broken automatically and connectivity is updated when changes are posted to the database. Using the default electricity capture settings, electricity nodes are inserted into an existing network as follows

To insert an electricity node into an existing network

1 Do one of the following:

- Choose **Capture** > **Insert Node** > *Node Name*.
- Click the appropriate button on the Munsys Electricity **Insert Node** toolbar.

2 Select a point on the electricity cable where you want to insert the node.

The underlying cable is broken, and the node is placed on its appropriate layer, to be verified when the integrity check is run.

Capturing electricity cables

Munsys Electricity caters for the capture of the following electricity cables:

Cable abbreviation	Description
OH EHV	Overhead Extra High Voltage cable
UG EHV	Underground Extra High Voltage cable
OH HV	Overhead High Voltage cable
UG HV	Underground High Voltage cable
OH LV	Overhead Low Voltage cable
UG LV	Underground Low Voltage cable
OH SL	Overhead Street Light cable
UG SL	Underground Street Light cable
OH SC	Overhead Service Connection cable
UG SC	Underground Service Connection cable

Table 3 Electricity cables

Overhead electricity cables are placed by selecting the start node, the end node, and then selecting intermediate nodes (if necessary).

Underground electricity cables can be captured at a specified offset distance from cadastral boundaries (offset cables), or drawn freehand.

If you set the Prompt for Cable Info check box on the Electricity Settings dialog box, the Cable Information dialog box will prompt you for cable information such as size, material, and the start and end status of the cable. If you did not set the Prompt for Cable Info check box when you specified the electricity settings, the default values will be assigned to the cable.

Capturing overhead electricity cables

Using the default capture settings, overhead electricity cables are placed as follows:

To place an overhead (OH) electricity cable

1 Do one of the following:

- Choose **Capture** > **Place OH Cable** > *Cable Name*.
- Click the appropriate button on the Munsys Electricity **Place OH Cable** toolbar.

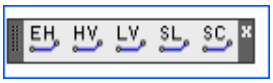


Figure 4 The Munsys Electricity Place OH Cable toolbar

2 Select the start node for the cable.

3 Select the end node for the cable.

4 Select the intermediate nodes for the cable, and then press **ENTER**.

5 Press **ENTER** to confirm the intermediate node selection.

The Cable Information dialog box is displayed.

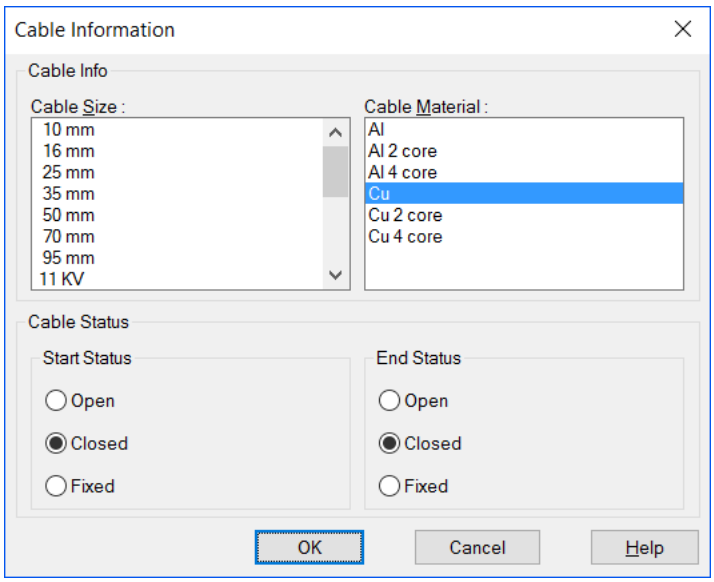


Figure 5 The Cable Information dialog box

6 Do the following on the **Cable Information** dialog box:

- From the **Cable Info** group, select the appropriate cable size and cable material.
- From the **Cable Status** group, set the **Start Status** and **End Status** to either **Open**, **Closed**, or **Fixed**.

7 Click **OK** to apply the values.

The cable is captured on its appropriate layer, to be verified when the integrity check is run.

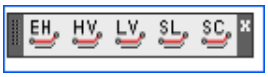
Placing underground electricity cables

Using the default capture settings, underground electricity cables are placed as follows:

To place an offset underground electricity cable

1 Do one of the following:

- Choose **Capture** > **Place Offset UG Cable** > *Cable Name*.
- Click the appropriate button on the Munsys Electricity **Offset UG Cable** toolbar.



2 Select the start node for the cable.

3 Select the end node for the cable.

The command line prompts you to specify points, or to specify a segment from which to offset the cable.

4 To place the cable by specifying points, do the following:

- Specify the first point
- Then specify next points for the electricity cable drawn as a straight-line segment or change to draw an arc segment [**A**rc/**H**alfwidth/**L**ength/**U**ndo/**W**idth].

By selecting A, the polyline linear list allows you to continue capturing offset electricity cables as a series of arcs. If selecting the Arc option, the polyline linear list changes with more selection options [Angle/CEnter/CLose/Direction/Halfwidth/Line/Radius/Second pt/Undo/Width].

Select L to return to drawing the electricity cables as series of straight-line segments.

- Press **ENTER** when you have specified all the points.
- Specify a point on the side to offset the cable.
- On the command line, specify the offset distance, or press **ENTER** to accept the default offset distance.

When the cable information has been set, the command line displays a message confirming that the cable was created successfully.

5 To place the cable by specifying offset segments, do the following:

- On the command line, type **O**, and then press **ENTER**.
- Specify a segment to offset the cable from.
- Specify a point on the side to offset the cable.
- 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 required segments have been selected, and then press **ENTER**.
- Press **ENTER** to confirm the selection

When the cable information has been set, the command line displays a message confirming that the cable was created successfully.

To place a freehand electricity cable

1 Do one of the following:

- Choose **Capture** > **Place Freehand UG Cable** > *Cable Name*.
- Click the appropriate button on the Munsys Electricity **Freehand UG Cable** toolbar.

2 Select the start node for the cable.

3 Select the end node for the cable.

4 Specify the first point

5 Then specify next point of the electricity cable drawn as a straight-line segment or change to draw an arc segment [**A**rc/**H**alfwidth/**L**ength/**U**ndo/**W**idth].

By selecting A, the polyline linear list allows you to continue capturing freehand electricity cables as a series of arcs. If selecting the Arc option, the polyline linear list changes with more selection options [Angle/CEnter/CLose/Direction/Halfwidth/Line/Radius/Second pt/Undo/Width].

Select L to return to drawing the electricity cable as series of straight-line segments..

6 Press **ENTER** when you have specified all the intermediate points.

The Cable Information dialog box is displayed.

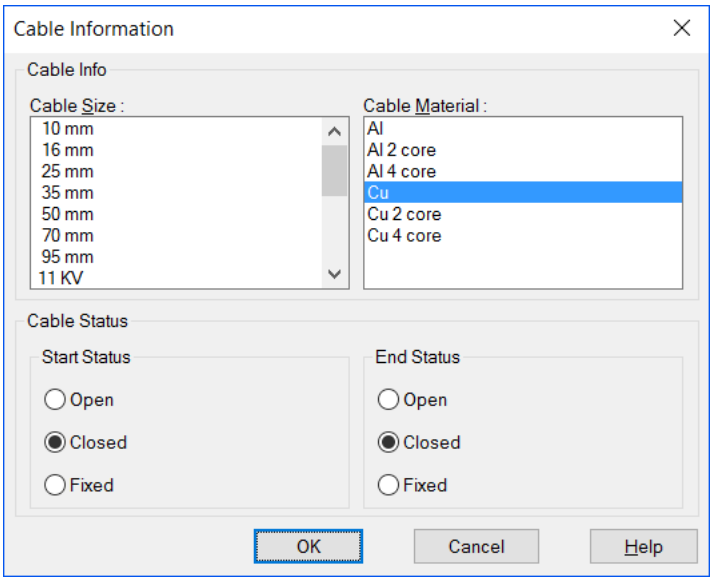


Figure 6 The Cable Information dialog box

7 Do the following on the **Cable Information** dialog box:

- From the **Cable Info** group, select the cable size and cable material.
- From the **Cable Status** group, set the **Start Status** and **End Status** to either **Open**, **Closed**, or **Fixed**.

8 Click **OK** to apply the values.

The cable is captured on its appropriate layer, to be verified when the integrity check is run.

Capturing service connections

Service connections create connectivity between the electricity network and land parcels. The service connection must extend a certain distance into the parcel. With Munsys Electricity, you can capture overhead (OH) and underground (UG) service connections. OH service connections can be placed radially, at a specified angle (45 or 90 degrees) to the land parcel, or drawn freehand. UG service connections can be placed at a specified angle (45 or 90 degrees) to the land parcel, drawn freehand, or placed at a specified offset distance from cadastral boundaries.

If you set the Service Connection Info check box on the Electricity Settings dialog box, the Cable Information dialog box will display when you have indicated the rotation angle/insertion point of the service connection. If you did not set the Service Connection Info check box when you specified the electricity settings, the default values will be assigned to the service connection.

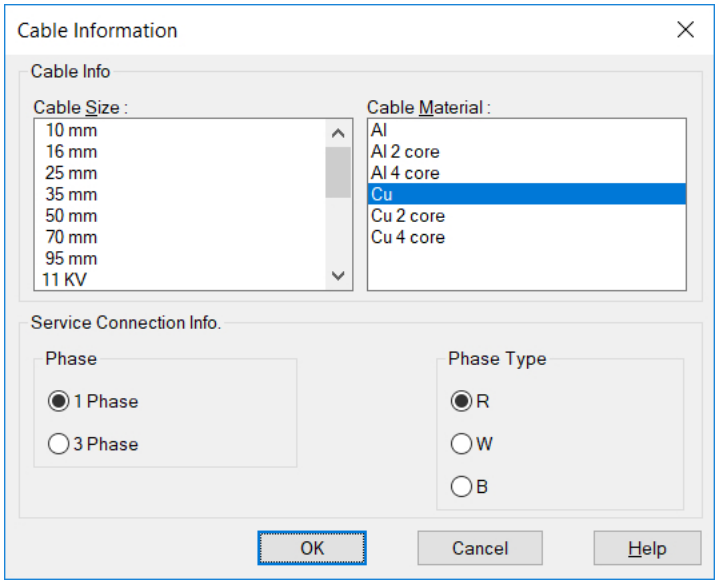


Figure 7 The Cable Information dialog box

9 Do the following on the **Cable Information** dialog box:

- From the **Cable Info** group, select the appropriate cable size and cable material.
- From the **Service Connection Info** group, set the **phase** and **phase type**.

10 Click **OK** to apply the values.

Placing overhead service connections

To place a freehand OH SC

1 Do one of the following:

- Choose **Capture** > **Place OH Service Connection** > **Freehand**.
- Click the **Place OH Service Connection Freehand** button on the Munsys Electricity **Place SC** toolbar.

2 Select the start node for the service connection (a transformer, pole or LV junction).

3 Then specify next point of the service connection drawn as a straight-line segment or change to draw an arc segment [**A**rc/**H**alfwidth/**L**ength/**U**ndo/**W**idth].

By selecting A, the polyline linear list allows you to continue capturing freehand service connections as a series of arcs. If selecting the Arc option, the polyline linear list changes with more selection options [Angle/CEnter/CLose/Direction/Halfwidth/Line/Radius/Second pt/Undo/Width].

Select L to return to drawing the service connections as series of straight-line segments.

4 Press **ENTER** to confirm the selection.

5 Select a point in the parcel to place the service connection.

The service connection is captured on the ELSERV_SC_OH layer, to be verified when the integrity check is run.

To place a direct OH SC at 45 or 90 degrees

1 To place a direct OH service connection at 45 degrees, do one of the following:

- Choose **Capture** > **Place OH Service Connection** > **45 Deg Direct**.
- Click the **Place OH Service Connection 45 Deg Direct** button on the Munsys Electricity **Place SC** toolbar.

2 To place a direct OH service connection at 90 degrees, do one of the following:

- Choose **Capture** > **Place OH Service Connection** > **90 Deg Direct**.
- Click the **Place OH Service Connection 90 Deg Direct** button on the Munsys Electricity **Place SC** toolbar.

3 Do the following for both service connection types:

- Select the start node for the service connection (a transformer, pole or LV junction).
- Rotate your mouse in a clockwise or counter-clockwise direction, and then click to display the service connection vector at angles of 45 or 90 degrees.

The service connection is captured on the ELSERV_SC_OH layer, to be verified when the integrity check is run.

To place a OH radial SC

1 To place a direct OH radial service connection, do one of the following:

- Choose **Capture** > **Place OH Service Connection** > **Radial**.
- Click the **Place OH Service Connection Radial** button on the Munsys Electricity **Place SC** toolbar.

2 Select the start node for the service connection (a transformer, pole or LV junction).

3 To specify the endpoint(s), do one of the following:

- Indicate the endpoint(s) inside the parcel(s) where you want to place the service connections
- On the command line, type P, press ENTER, and then select the appropriate parcel boundaries of the parcels where you want to place the service connections.

The radial service connection(s) are placed as indicated.

Placing underground service connections

To place an offset UG SC

1 Do one of the following:

- Choose **Capture** > **Place UG Service Connection** > **Offset**.
- Click the **Place UG Service Connection Offset** button on the Munsys Electricity **Place SC** toolbar.

2 Select the start node for the service connection (a standard sub, pole, mini sub, LV junction or distribution box).

The command line prompts you to specify points, or to specify a segment from which to offset the service connection.

3 To place the service connection by specifying points, do the following:

4 Specify the first point Then specify next point of the service connection drawn as a straight-line segment or change to draw an arc segment [**A**rc/**H**alfwidth/**L**ength/**U**ndo/**W**idth].

By selecting A, the polyline linear list allows you to continue capturing freehand service connections as a series of arcs. If selecting the Arc option, the polyline linear list changes with

more selection options [Angle/CEnter/CLose/Direction/Halfwidth/Line/Radius/Second pt/Undo/Width].

Select L to return to drawing the service connections as series of straight-line segments.

- Press **ENTER** when you have specified all the points.
- Specify a point on the side to offset the service connection.
- On the command line, specify the offset distance, or press **ENTER** to accept the default offset distance.
- Next, select a point within the parcel where you want to place the service connection.

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

5 To place the service connection by specifying offset segments, do the following:

- On the command line, type **O**, and then press **ENTER**.
- Specify a segment to offset the service connection from.
- Specify a point on the side to offset the service connection.
- 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 required segments have been selected, and then press **ENTER**.
- Press **ENTER** to confirm the selection
- Next, select a point within the parcel where you want to place the service connection.

The service connection is captured on the ELSERV_SC_UG layer, to be verified when the integrity check is run.

To place a freehand UG SC

1 Do one of the following:

- Choose **Capture** > **Place UG Service Connection** > **Freehand**.
- Click the **Place UG Service Connection Freehand** button on the Munsys Electricity **Place SC** toolbar.

2 Select the start node for the service connection (a standard sub, pole, mini sub, LV junction or distribution box).

3 Specify the first point for the service connection.

4 Then specify next point of the service connection drawn as a straight-line segment or change to draw an arc segment [**A**rc/**H**alfwidth/**L**ength/**U**ndo/**W**idth].

By selecting A, the polyline linear list allows you to continue capturing freehand service connections as a series of arcs. If selecting the Arc option, the polyline linear list changes with more selection options [Angle/CEnter/CLose/Direction/Halfwidth/Line/Radius/Second pt/Undo/Width].

Select L to return to drawing the service connections as series of straight-line segments.

5 , and then specify the next points.

6 Press **ENTER** to confirm the selection.

7 Select a point in the parcel to place the service connection.

The service connection is captured on the ELSERV_SC_UG layer, to be verified when the integrity check is run.

To place a direct UG SC at 45 or 90 degrees

1 To place a direct UG service connection at 45 degrees, one of the following:

- Choose **Capture** > **Place UG Service Connection** > **45 Deg Direct**.
- Click the **Place UG Service Connection 45 Deg Direct** button on the Munsys Electricity **Place SC** toolbar.

2 To place a direct UG service connection at 90 degrees, one of the following:

- Choose **Capture** > **Place UG Service Connection** > **90 Deg Direct**.
- Click the **Place UG Service Connection 90 Deg Direct** button on the Munsys Electricity **Place SC** toolbar.

3 Do the following for both service connection types:

- Select the start node for the service connection (a standard sub, pole, mini sub, LV junction or distribution box).
- Rotate your mouse in a clockwise or counter-clockwise direction, and then click to display the service connection vector at angles of 45 or 90 degrees.

The service connection is captured on the ELSERV_SC_UG layer, to be verified when the integrity check is run.

To place a UG radial SC

1 To place a direct UG radial service connection, do one of the following:

- Choose **Capture** > **Place UG Service Connection** > **Radial**.
- Click the **Place UG Service Connection Radial** button on the Munsys Electricity **Place SC** toolbar.

2 Select the start node for the service connection (a standard sub, pole, mini sub, LV junction or distribution box).

3 To specify the endpoint(s), do one of the following:

- Indicate the endpoint(s) inside the parcel(s) where you want to place the service connections
- On the command line, type P, press ENTER, and then select the appropriate parcel boundaries of the parcels where you want to place the service connections.

The radial service connection(s) are placed as indicated.

Checking electricity cable direction

When you have captured all the electricity nodes and cables, you can check the physical direction of the electricity cables in the network. You can change the direction of the start and end points of electricity cables if necessary. When you have checked and changed the cable direction where necessary, the direction arrows are removed from the drawing.

To show electricity cable direction

1 Do one of the following:

- Choose **Capture** > **Show Cable Direction**.
- Click the **Show Cable Direction** button on the Munsys Electricity **Connectivity** toolbar.

2 Select the appropriate electricity cables, and then press **ENTER**.

A direction arrow on each selected object indicates the cable direction, as shown in the following figure:

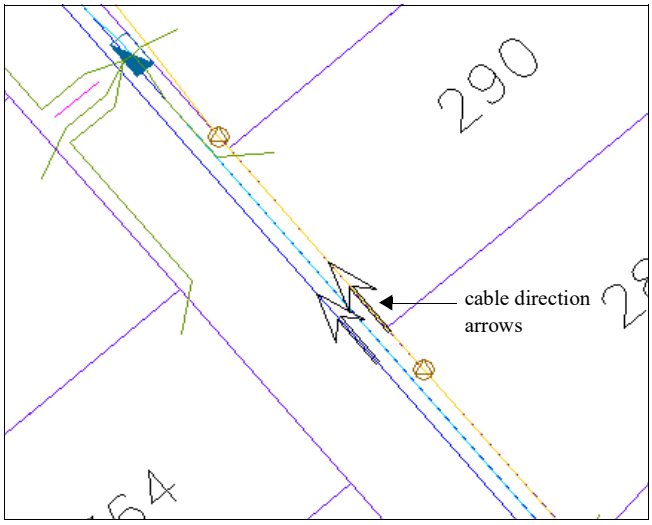


Figure 8 Showing electricity cable direction

To change electricity cable direction

1 Do one of the following:

- Choose **Capture** > **Change Cable Direction**.
- Click the **Change Cable Direction** button on the Munsys Electricity **Connectivity** toolbar.

2 Select the appropriate electricity cables, and then press **ENTER**.

The direction of the start and end points of the cables are changed, and the start/end node attributes for the cables are updated.

To clear direction arrows

1 Do one of the following:

- Choose **Capture** > **Clear Direction Arrows**.
- Click the **Clear Direction Arrows** button on the Munsys Electricity **Connectivity** toolbar.

The direction arrows are removed from the drawing.

Capturing ducts

Electricity ducts are normally constructed to carry main cables under the road, and can be used to add new cables without road excavation. Ducts typically consist of a number of pipes with the same diameter. When ducts are captured, the Electricity Duct dialog box is used to specify the duct type – *Duct* or *Crossing*. Ducts are normally laid during road construction.

To place a duct

1 Do one of the following:

- Choose **Capture** > **Place Duct**.
- Click the **Place Duct** button on the Munsys Electricity **Capture** toolbar.

2 Indicate the start point of the duct on the cadastral boundary.

3 Indicate the end point of the duct on the cadastral boundary.

The Electricity Duct dialog box is displayed.

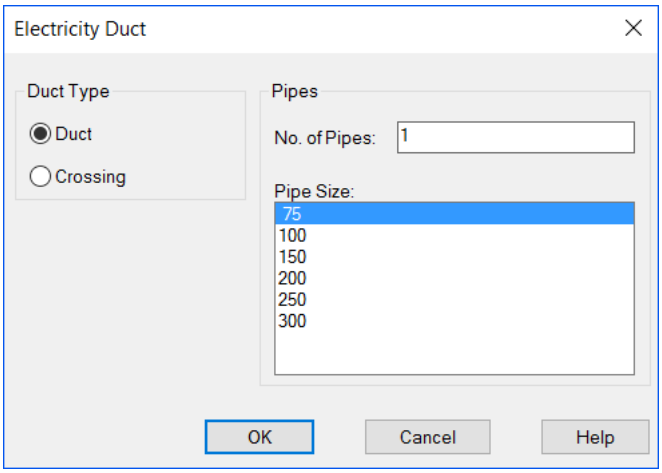


Figure 9 The Electricity Duct dialog box

4 On the **Electricity Duct** dialog box, do the following:

- From the **Duct Type** group, specify the duct type (**Duct** or **Crossing**).
- From the **Pipes** group, specify the number of pipes, and the pipe size.
- Click **OK** to apply the specifications.

The duct is captured on the ELDUCT layer, to be verified when the integrity check is run.

Capturing electricity attribute data

Attaching a node reference

With this function, you can attach a reference number to a selected electricity node.

To attach a node reference

1 Do one of the following:

- Choose **Capture** > **Attach Node Reference...**
- Click the **Attach Node Reference** button on the Munsys Electricity **Capture** toolbar.

2 Select the node that you want to attach a reference number to.

The Electricity Node Reference text box is displayed.

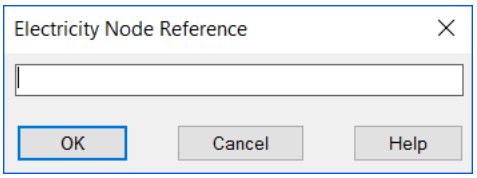


Figure 10 The Electricity Node Reference text box

3 Enter the node reference, and then click **OK** to attach the reference to the node.

Placing an electricity note

For map production purposes, information about an electricity object can be added in the form of a note.

To place an electricity note

1 Do one of the following:

- Choose **Capture** > **Place Electricity Note**.
- Click the **Place Electricity Note** button on the Munsys Electricity **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 placed on the ELNOTE layer, to be verified when the integrity check is run.

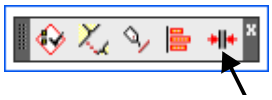
Capturing electricity dimensions

Dimensions supply additional information in terms of the location of an electricity object, relative to cadastral data or other electricity objects. Dimension arrows are used to indicate distances from known points, and can facilitate maintenance teams who need to locate services. Dimensions are captured on the ELDIM layer, and are linked with related text to indicate the distance of the electricity object relative to other electricity objects or cadastral data.

To place dimension arrows

1 Do one of the following:

- Choose **Capture** > **Place Dimension Arrow**.
- Click the **Place Dimension Arrow** button on the Munsys Electricity **Capture** toolbar.



2 Specify the first segment for dimension.

The dimension arrows will be placed perpendicular to this segment.

3 Specify the second segment for dimension.

The dimension arrows are aligned to the point selected on this segment.

4 On the command line, enter the offset distance, or press **ENTER** to accept the default offset distance as determined in the Electricity Settings, or press **A** to place the actual calculated distance.

The dimension text is placed at the dimension arrows, indicating the distance between the two dimension lines.

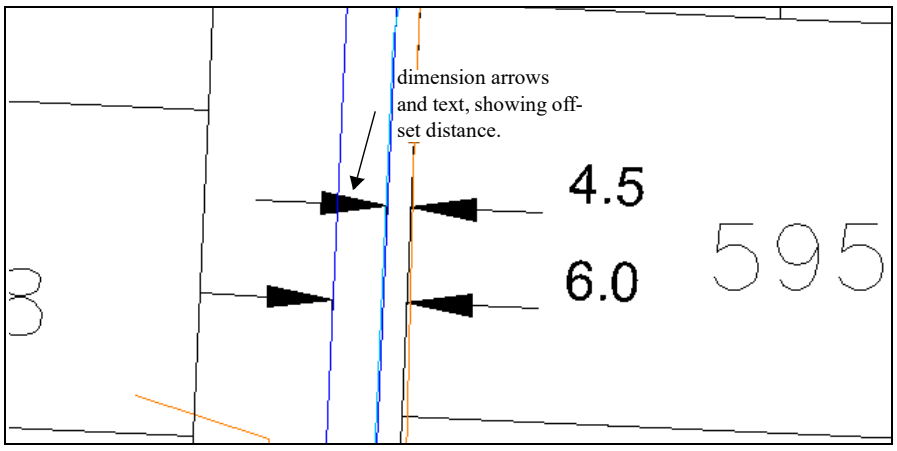


Figure 11 Dimension arrows

Capturing electricity zones

Electricity zones are captured as polygons that surround a certain part of the electricity network. They are usually drawn to indicate a certain transformer supply area. The zone is placed by drawing a boundary, and then placing a tag (the electricity zone tag consists of the node ID of the supply node). The polygon builder uses the lines and tag to create a zone polygon. The supply nodes can be a switch station, standard sub, mini sub, or transformer.

To draw an electricity zone boundary

An electricity zone boundary is drawn by selecting consecutive points to form a polygon. These lines are created on the ELZONE_LINES layer, to be used by the polygon builder.

1. Choose **Capture** > **Electricity Zone** > **Draw Zone Boundary**.
2. Specify the first polygon point.
3. Specify the next polygon points, and then press **ENTER**.
4. Press **ENTER** to close the polygon, or type **N** on the command line to specify more points.

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

To place an electricity zone tag

1. Choose **Capture** > **Electricity Zone** > **Place Zone Tag**.
2. Select the supply node for the electricity zone.
3. Specify the insertion point for the tag.
4. On the command line, specify the tag height, or press **ENTER** to accept the default height.
5. To specify the tag angle, do one of the following:
   - Indicate the tag angle with your mouse.
   - On the command line, type **A** to align the tag to an object, press **ENTER**, and then select the object to which you want to align the tag.

   The tag, consisting of the node ID of the supply node, is inserted as specified.

To generate electricity zone polygons

This function is used to generate a closed polygon from the lines and tag that were created with the electricity zone. The function verifies that the zone polygon forms a closed area. The electricity integrity check still needs to verify the standard business rules for electricity before the zone is posted to the database. Electricity zone polygons are generated on the ELZONE layer.

1 Choose **Capture** > **Electricity Zone** > **Generate Zone Polygons**.

2 Select all the lines for the electricity zone, and then press **ENTER**.

3 Select the electricity zone tag, and then press **ENTER**.

The command line indicates that the polygon has been built successfully.

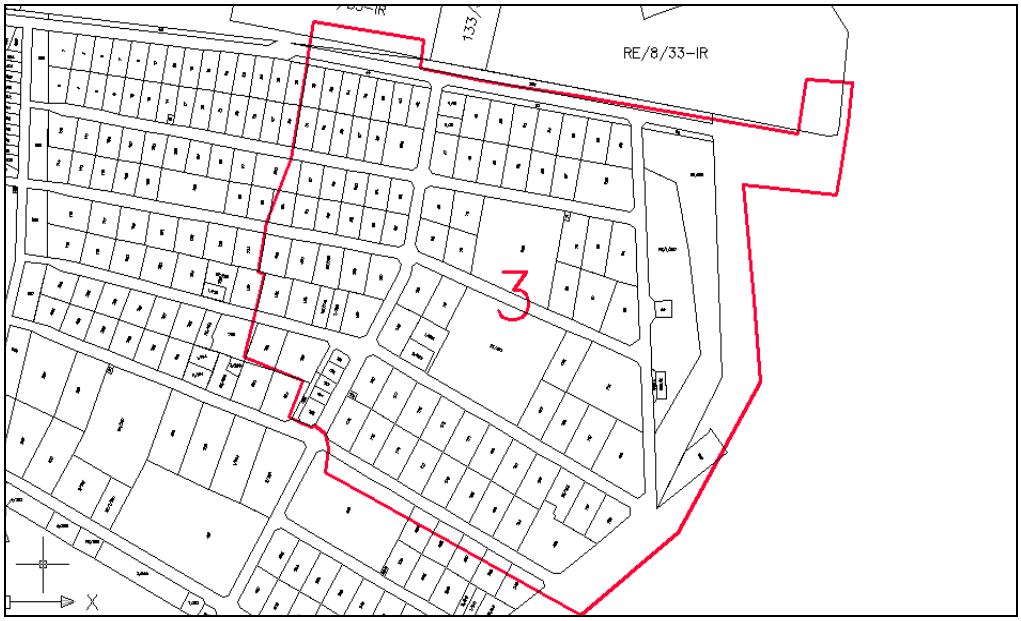


Figure 12 An electricity zone

Checking electricity 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.

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 electricity 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 Electricity 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 13 The electricity object integrity check

When electricity 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.
Cables within snap tolerance	Cables are checked to see if they were snapped to other cable end points. Where cable end points are not exactly on the other end point, but within *EMS_CABLE_TOL* tolerance, these are adjusted, when possible.
Cables without nodes	Checks whether each cable is connected to a node at both ends of the cable.
Nodes within snap tolerance	Nodes are checked to see if they are within tolerance of the cable end points. Where a node is not exactly on the cable end point, but within the *EMS_NODE_TOL* tolerance of the end point, the node is adjusted where possible.
Nodes with too many cables	A rule specifies that the node may only be connected to a maximum number of cables.
Nodes with too few cables	A rule specifies that the node must be connected to a minimum number of cables.
Duplicate nodes	Two nodes on top of each other within *EMS_NODE_TOL* tolerance.
Service connections within snap tolerance	Checks whether service connections can be snapped to cables where possible and when necessary.
Service connections without nodes	Checks for service connections that are not connected to any nodes.
Service connections with incorrect nodes	Checks for service connections not connected to the right node type.

Table 14 The electricity network integrity check

Checking electricity 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.

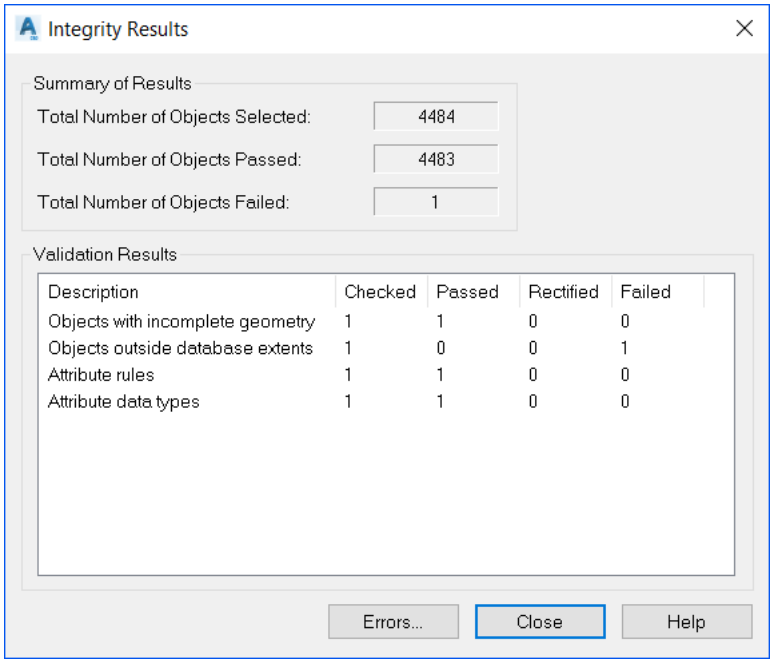


Figure 15 The Integrity Results dialog box

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:

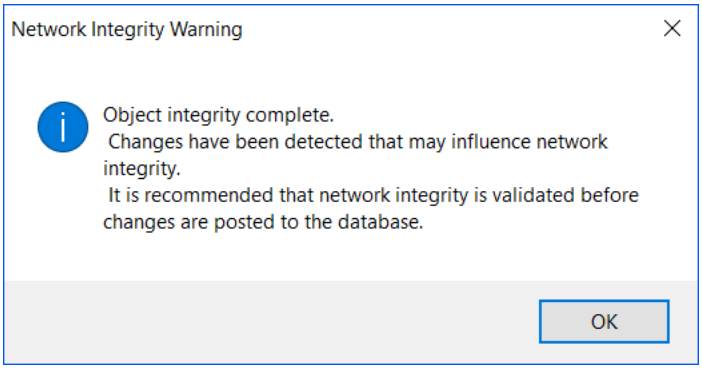


Figure 16 Network Integrity Warning

Checking electricity 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:

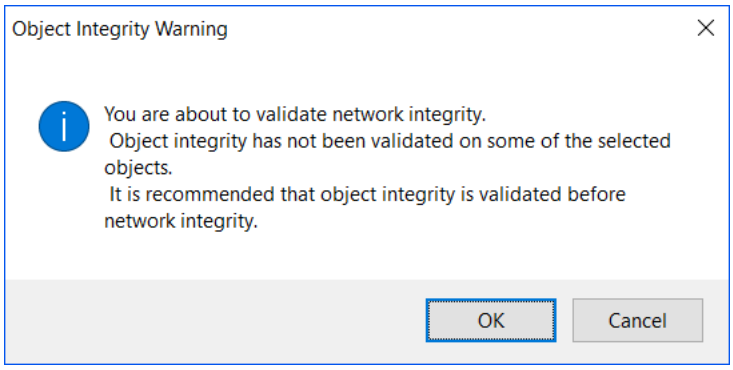


Figure 17 Object Integrity Warning

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.

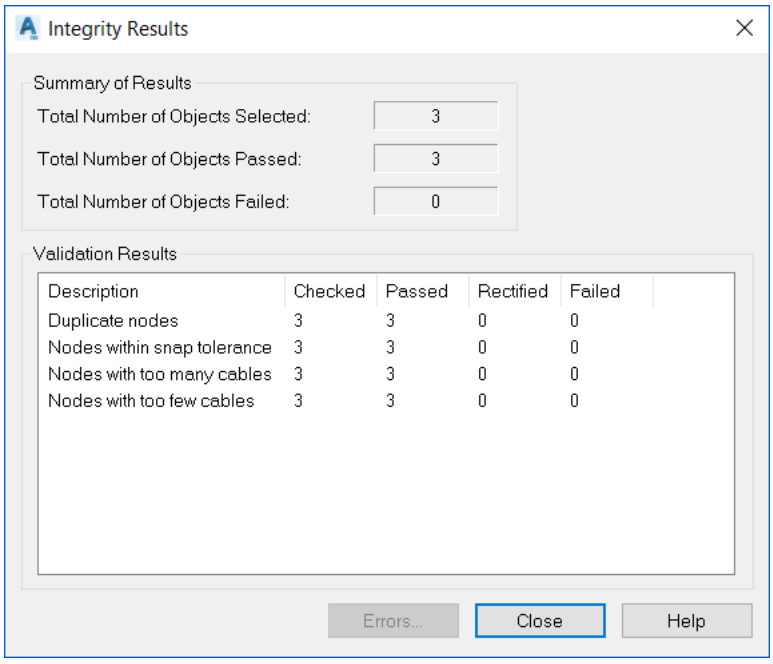


Figure 18 The Integrity Results dialog box

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.

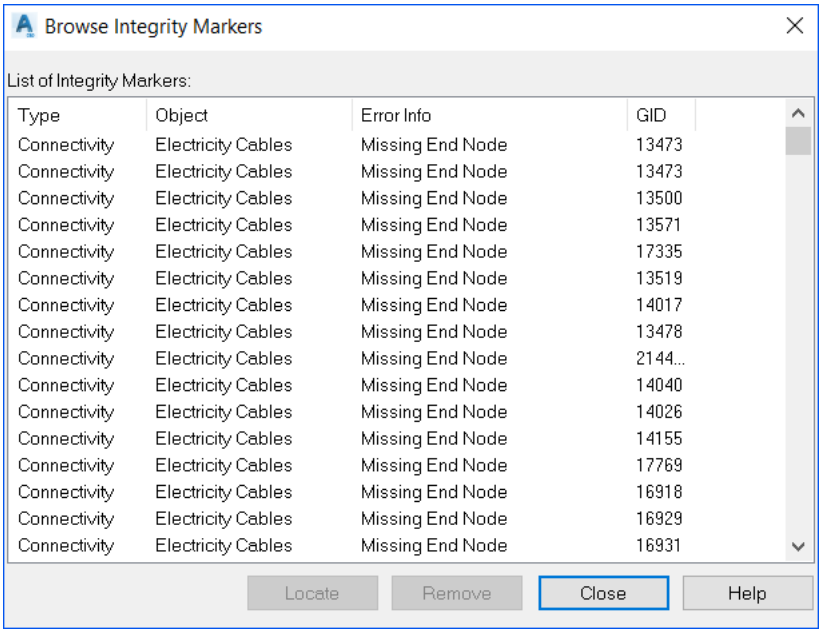


Figure 19 The Browse Integrity Markers dialog box

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 electricity data to the database

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

To post electricity 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.

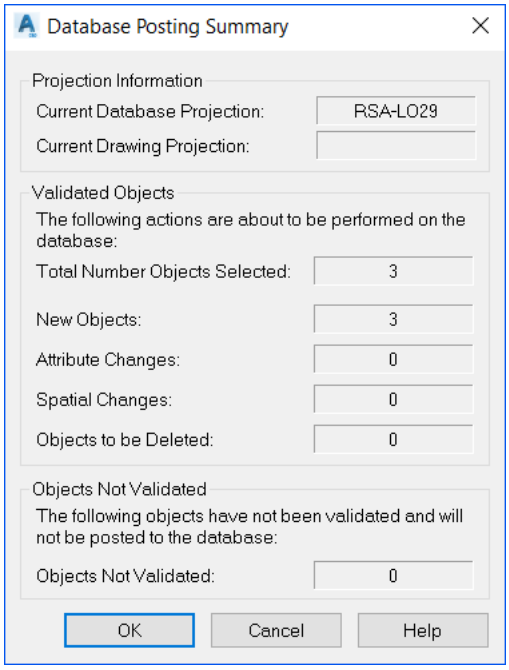


Figure 20 The Database Posting Summary dialog box

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.

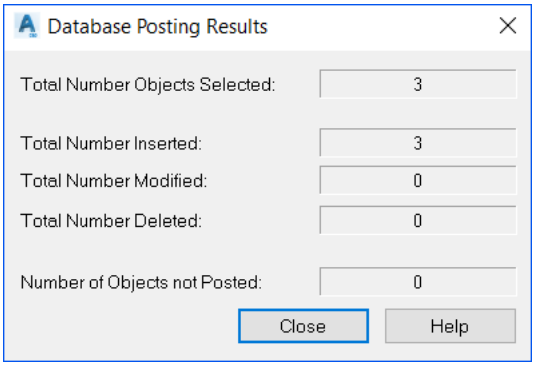


Figure 21 The Database Posting Results dialog box

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 Electricity application, only electricity 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:

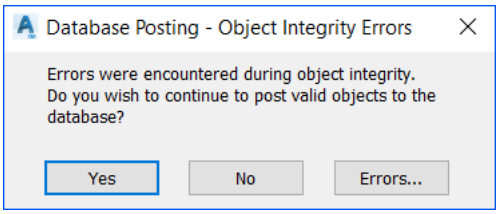


Figure 22 Database Posting – Object Integrity Errors

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 on the Browsing Integrity Markers dialog box.

Electricity network quality reporting

The Network Quality Report function on the Extras menu is used to validate the quality of the entire electricity 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, for example the start and end nodes of an electricity cable. The network quality report will validate these values based on electricity-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 electricity errors that may occur:

Spatial Table	Error	Description
SP_ELCABLE	NODE MISSING	The START_NODE/END_NODE/SST_ID/SUB-_ID value is NULL, or the node ID was not found in the SP_ELNODE table
SP_ELNODE	ID NULL	The value of the NODE_ID, SST_ID or SUB_ID column is NULL.
SP_ELNODE	SEQUENCE EXCEEDED	The value in the NODE_ID column exceeds the current value of the EMS_ELNODE sequence
SP_ELNODE	ID NOT UNIQUE	The NODE_ID column contains a non-unique value
SP_ELNODE	INVALID VALUE	A value in the SST_ID or SUB_ID column is not found in the SP_ELNODE table
SP_ELSERV	UNCON-NECTED SC	The value in the START_NODE or PRCL_GID column is Null, or The START_NODE value was not found in the SP_ELNODE table, or the PRCL_GID value was not found in the SP_PAR-CEL table

Figure 23 Electricity network quality errors

To validate electricity 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:

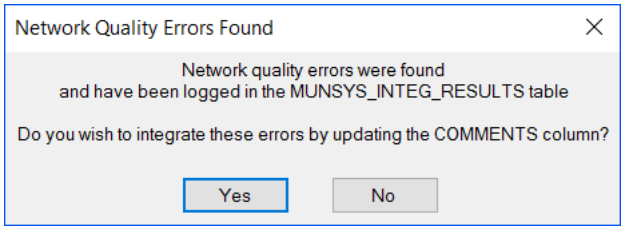


Figure 24 Network Quality errors found

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

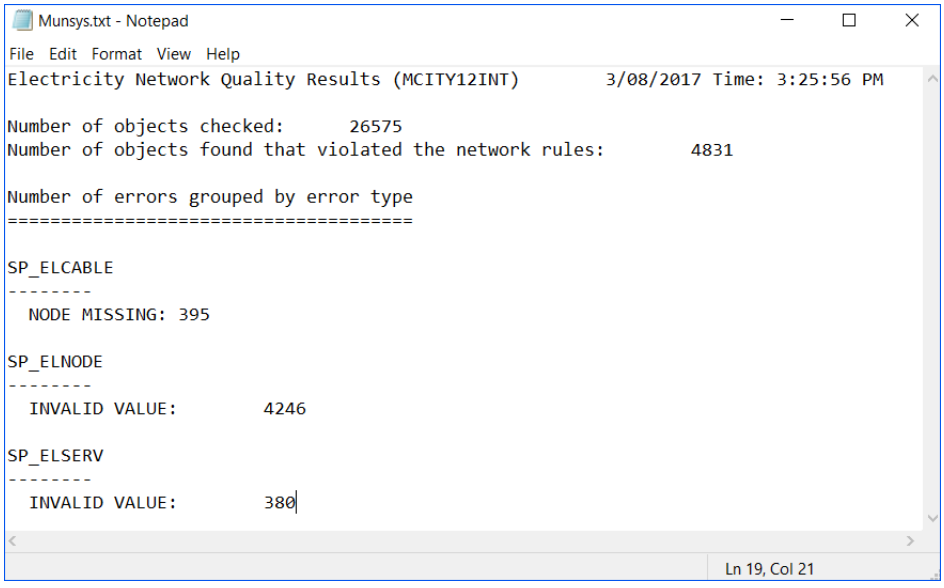


Figure 25 An electricity network quality report

Generating electricity 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 electricity objects:

- a summary of all the electricity objects in the database
- a summary of the total length and number of cables by category
- a summary of the total length and number of cables by type
- a summary of the total length and number of cables by diameter
- a summary of the total length and number of service connections by type
- a summary of the total length and number of service connections by diameter
- a summary of the number of electricity nodes by node type

To generate a electricity 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.

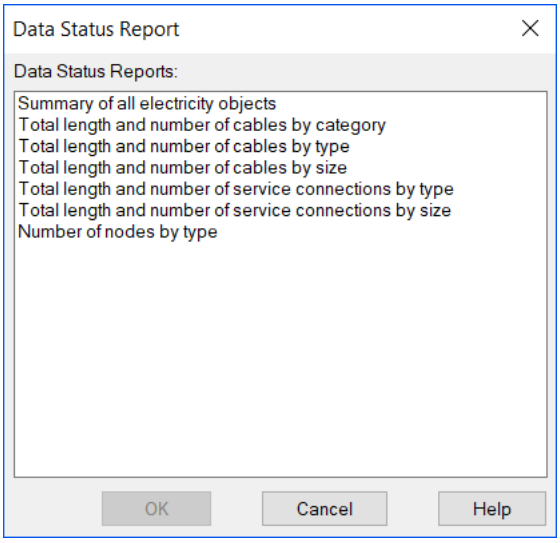
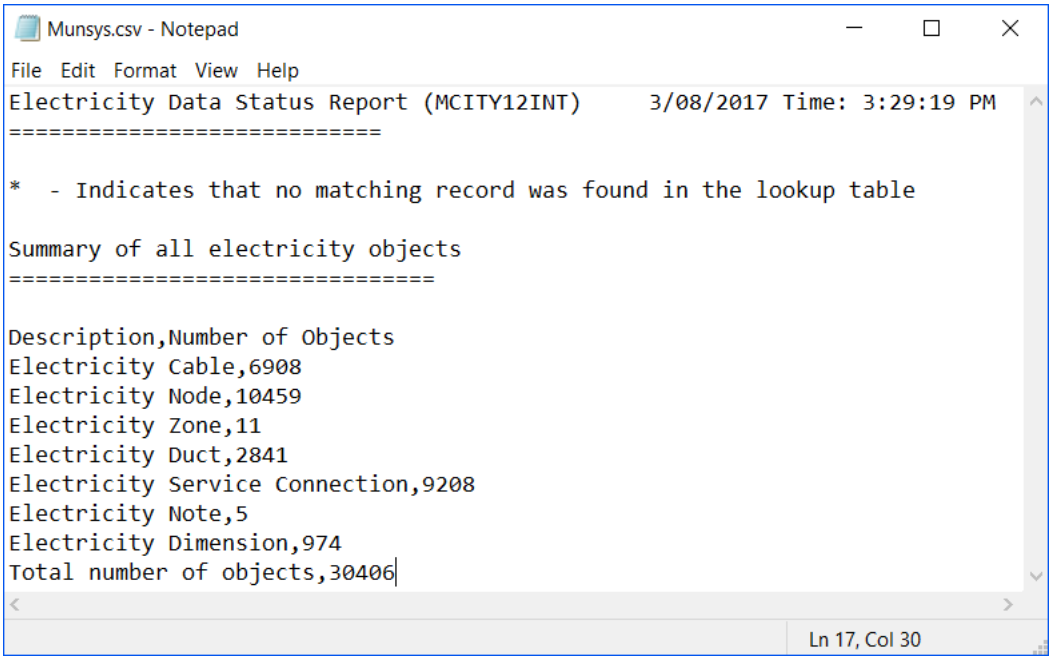


Figure 26 The Data Status Report dialog box

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 electricity objects

Converting AutoCAD entities to electricity objects

With Munsys, you can convert selected AutoCAD entities to Munsys Electricity objects. Block entities can be converted to electricity nodes (switch stations, standard subs, pylons, etc.), line entities can be converted to electricity cables or service connections, text can be converted to an electricity zone tag or an electricity note, and polygons can be converted to electricity zones.

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 electricity nodes

With this function, you can convert AutoCAD block entities to any of the available electricity nodes. To convert block entities to electricity nodes, do the following:

1 Choose **Extras** > **Convert Block to** > ***Electricity Node Name***.

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

One electricity node is created for each block entity that you selected, and the drawing is updated accordingly.

To convert line entities to electricity objects

With this function, you can convert line entities to electricity cables and service connections.

To convert line entities to electricity objects, do the following:

1 Choose **Extras** > **Convert Line to** > ***Electricity Object Name***.

2 Select the line objects that you want to convert to electricity objects, and then press **ENTER**.

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

To convert text to electricity notes or tags

With this function, you can convert AutoCAD text entities to electricity zone tags or electricity notes.

1 Do one of the following:

- Choose **Extras** > **Convert Text to** > **Zone Tag**.
- Choose **Extras** > **Convert Text to** > **Electricity Note**.

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

The entities are converted to the electricity objects that you specified, and the drawing is updated accordingly.

To convert polygons to electricity zones

1 Choose **Extras** > **Convert Polygon to** > **Zone**.

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

The polygons are converted to electricity zones, and the drawing is updated accordingly.

Chapter 5
Maintaining electricity data

Modifying electricity data

Spatial and attribute data is stored in tables as records. Electricity objects that needs to be edited are retrieved from the database onto their respective layers, for example, ELDUCT (electricity ducts) and ELSERV (service connections).

From the Munsys Electricity Change menu, you can edit attributes, move and rotate nodes, edit the vertex of an electricity cable, change cable, node and service connection attributes, reset nodes and reconnect cables, add comments, change electricity notes, and delete and undelete electricity objects.

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

Editing attributes

The Edit Attributes function is used to edit the attributes of one or more selected electricity 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 Electricity, only electricity objects may be selected. If you select more than one object type (for example cables and nodes), 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 electricity objects

1 Choose **Change** > **Edit Attributes...**

2 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.

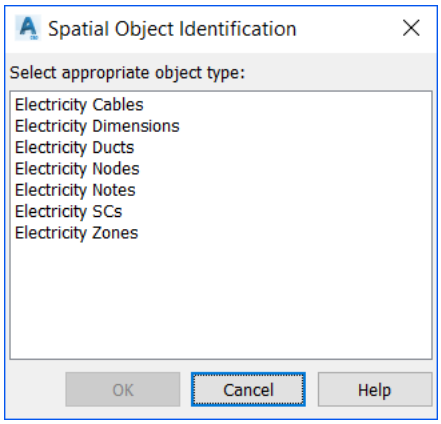


Figure 1 The Spatial Object Identification dialog box

3 Select a single spatial object type to edit, and then click OK.

The Edit Attributes: [*Object Type*] dialog box is displayed.

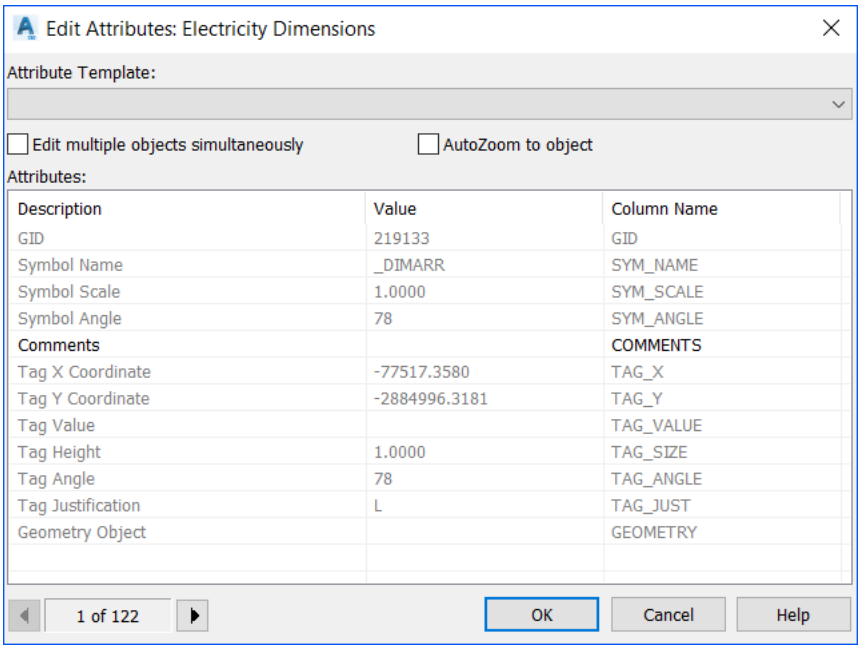


Figure 2 The Edit Attributes dialog box

4 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**.

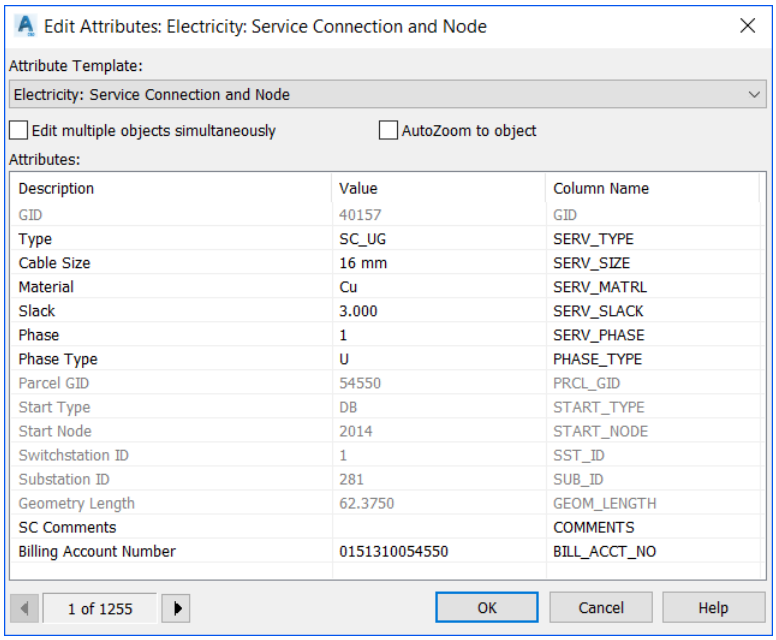


Figure 3 Edit Attributes: Selecting an attribute template

5 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:

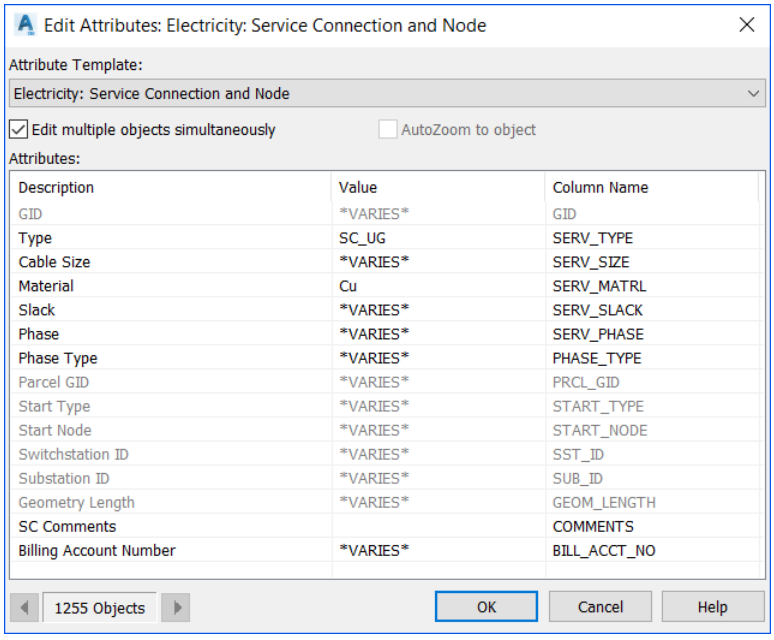


Figure 4 The Edit Attributes dialog box: Edit multiple objects simultaneously

6 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.

7 To edit an attribute, do one of the following:

- Highlight a value, and then choose a value from the list in the **Value** column.
- Highlight a value, and then enter a new value in the Value column

8 Click OK to apply the new value(s) to the object(s).

9 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 Electricity, only electricity objects may be selected. If you select more than one object type (for example cables and nodes), 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 electricity nodes

With Munsys Electricity, you can make changes to electricity nodes, such as moving a node to a new destination, or rotating a node by 180 degrees. You can also make attribute changes to electricity nodes, such changing the node description or the node group. An electricity node can also be reset.

To move an electricity node

1 Do one of the following:

- Choose **Change** > **Move Node**.
- Click the **Move Node** button on the Munsys Electricity **Change** toolbar.

2 Select the node that you want to move.

3 Specify a new insertion point for the node.

The node is moved to the specified point.

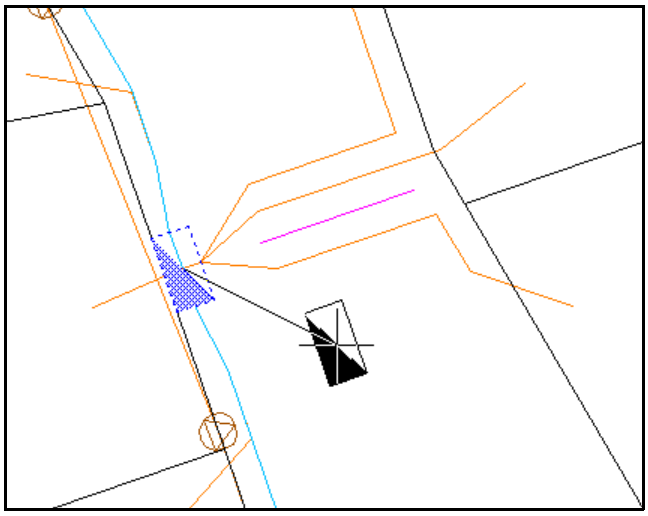
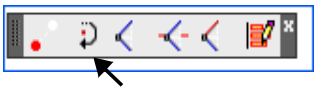


Figure 5 Moving a node

To rotate an electricity node by 180 degrees

1 Do one of the following:

- Choose **Change** > **Rotate Node 180**.
- Click the **Rotate Node 180** button on the Munsys Electricity **Change** toolbar.



2 Select the node that you want to rotate, and then press **ENTER**.

The node is rotated by 180 degrees.

Tip You can select more than one node to rotate.

To change a node description

1 Choose **Change** > **Node Attribute** > **Change Node Description...**

2 Select the applicable node.

The Node Description text box displays, showing the current node description.

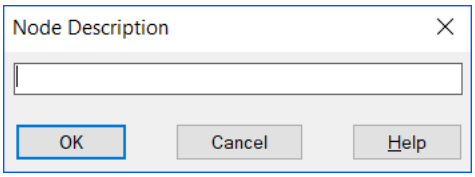


Figure 6 The Node Description dialog box

3 Type a new value in the text box, and then click **OK**.

To change a node group

1 Choose **Change** > **Node Attribute** > **Change Node Group...**

2 Select the node or nodes that you want to change.

The Node Groups dialog box is displayed, showing the current group. If you selected more than one node, no current group is displayed.

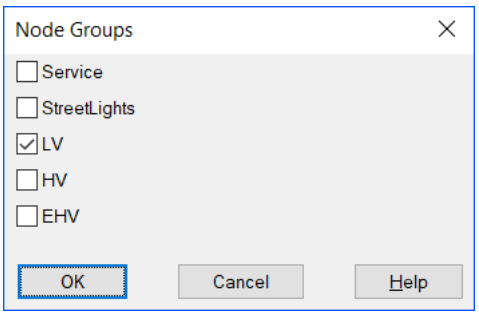


Figure 7 The Node Groups dialog box

3 Select the new node group or groups for the selected nodes, and then click **OK**.

To reset a node

1 Choose **Change** > **Connectivity** > **Reset Node**.

2 Select the node or nodes that you want to reset, and then press **ENTER**.

A warning message displays: "Resetting nodes can destroy the network connectivity. You must also post changes before attaching new cables if the node already exists in the database."

3 On the command line, type **RESET** in uppercase, and then press **ENTER**, or press **Esc** to exit the function.

Note A node is usually reset when a new cable is attached to the node. You would first reset the node, and then connect the new cable to the node.

Changing electricity cables

With Munsys Electricity, you can make changes to electricity cables, such as changing, adding or inserting a vertex into a cable. You can also make attribute changes to cables, such as changing cable size, material or start and end status. Cables can be reconnected to repair connectivity.

To change a cable vertex

This function moves the endpoint of an electricity cable to a new destination point.

1 Do one of the following:

- Choose **Change** > **Change Cable Vertex**.
- Click the **Change Cable Vertex** button on the Munsys Electricity **Change** toolbar.

2 Select the cable closest to the change point, press **ENTER**, and then specify the new destination point.

To insert a cable vertex

1 Do one of the following:

- Choose **Change** > **Insert Cable Vertex**.
- Click the **Insert Cable Vertex** button on the Munsys Electricity **Change** toolbar.

2 Select the appropriate electricity cable, and then select the segment where you want to add the new point.

3 Select the position for the new point.

The vertex is inserted at the position that you selected.

To add a cable vertex

1 Do one of the following:

- Choose **Change** > **Add Cable Vertex**.
- Click the **Add Cable Vertex** button on the Munsys Electricity **Change** toolbar.

2 Select the appropriate electricity cable.

3 Select the endpoint of the segment where you want to add the vertex, and then select a position for the new point.

The vertex is inserted at the point you selected.

To change cable size

1 Choose **Change > Cable Attribute** > **Change Cable Size...**

2 Select the cable that you want to change, and then press **ENTER**.

The Select Cable Size dialog box is displayed, highlighting the size of the cable that you selected. If you selected multiple cables, no current size is displayed.

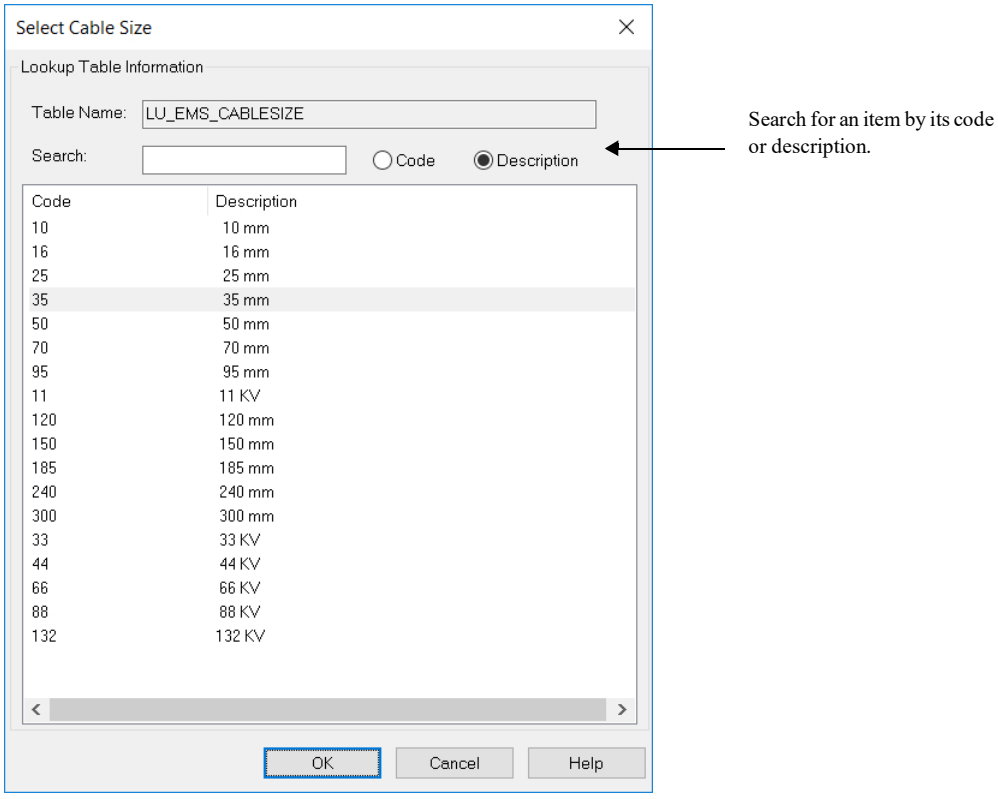


Figure 8 The Select Cable Size dialog box

3 Select the appropriate cable size, and then click **OK** to apply.

To change cable material

1 Choose **Change** > **Cable Attribute** > **Change Cable Material...**

2 Select the cable that you want to change, and then press **ENTER**.

The Select Cable Material dialog box is displayed, highlighting the material of the cable that you selected. If you selected multiple cables, no current material is displayed.

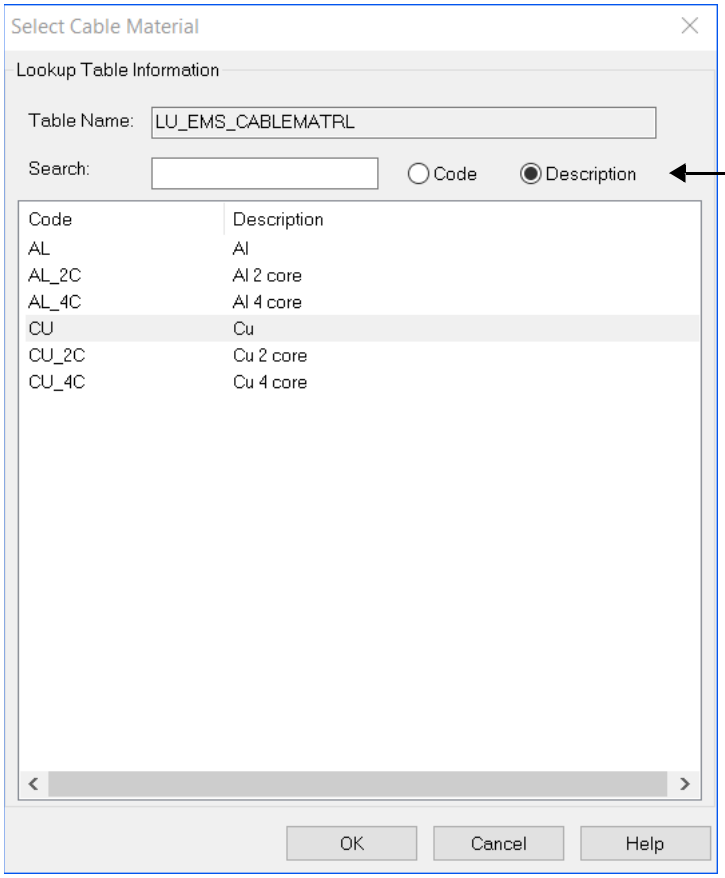


Figure 9 The Select Cable Material dialog box

3 Select the appropriate cable material, and then click **OK** to apply.

To change cable status

1 Choose **Change** > **Cable Attribute** > **Change Cable Status...**

2 Select the cable that you want to change, and then press **ENTER**.

The Cable Status dialog box is displayed.

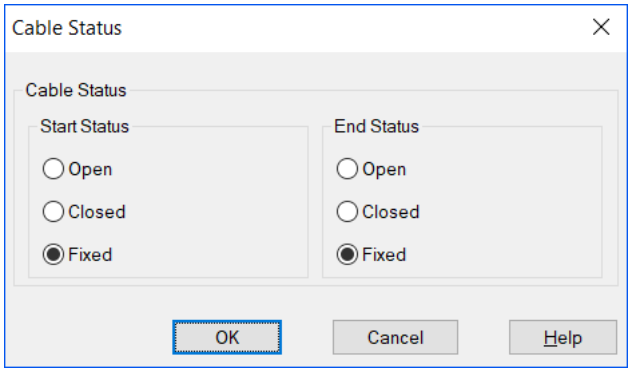


Figure 10 The Cable Status dialog box

3 Specify the new **Start Status** and **End Status** for the cable, and then click **OK** to apply.

To reconnect an electricity cable

1 Choose **Change** > **Connectivity** > **Reconnect Cable**.

2 Select the cable that you want to reconnect.

3 Select the start node for the cable, as prompted by the command line.

4 Select the end node for the cable.

Note If you selected a service connection cable, you will not be prompted for the end node.

The cable is reconnected.

Changing service connections

With Munsys Electricity, you can change the attribute information attached to service connections, such as service connection size, material and the service phase. You can also link service connections to parcels or buildings.

To change service connection size

1 Choose **Change** > **SC Attribute** > **Change SC Size...**

2 Select the service connection/s of which you want to change the size, and then press **ENTER**.

The Select SC Size dialog box is displayed, highlighting the size of the service connection that you selected. If you selected multiple service connections, no current size is displayed.

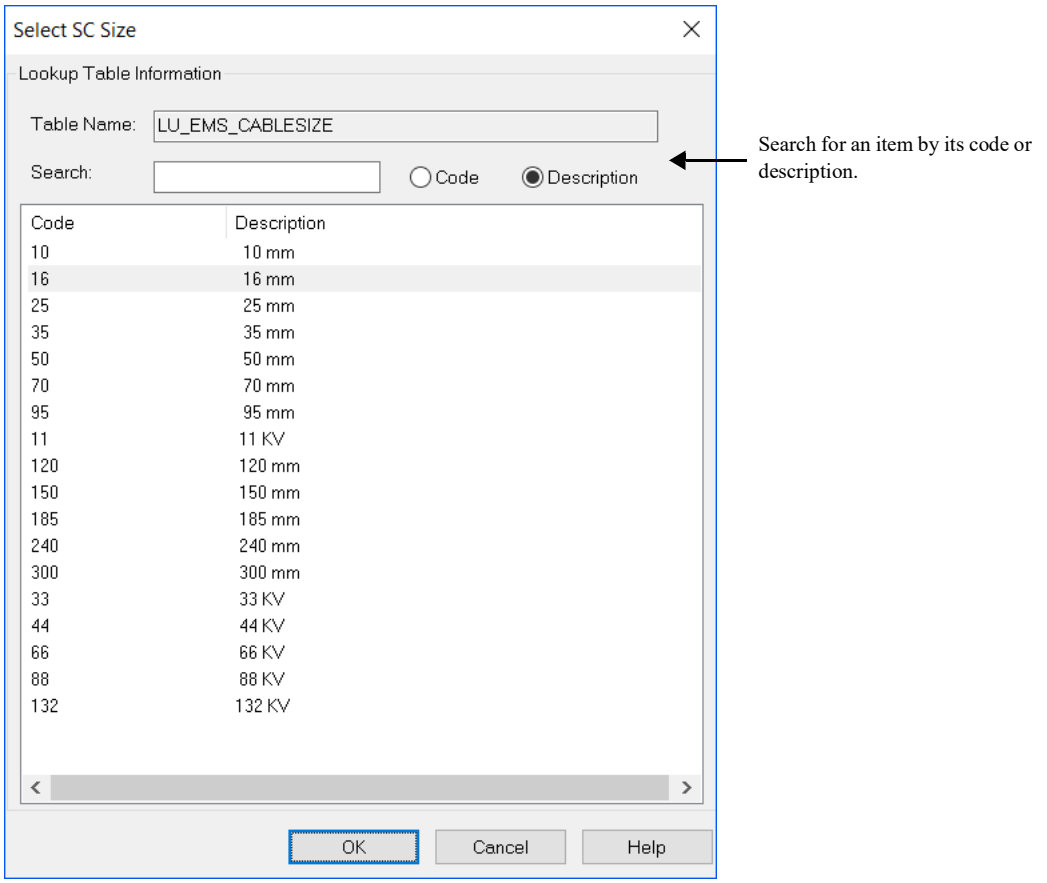


Figure 11 The Select SC Size dialog box

3 Select the new size from the list, and then click **OK**.

The service connections are updated accordingly.

To change service connection material

1 Choose **Change** > **SC Attribute** > **Change SC Material...**

2 Select the service connection/s of which you want to change the material, and then press **ENTER**.

The Select SC Material dialog box is displayed.

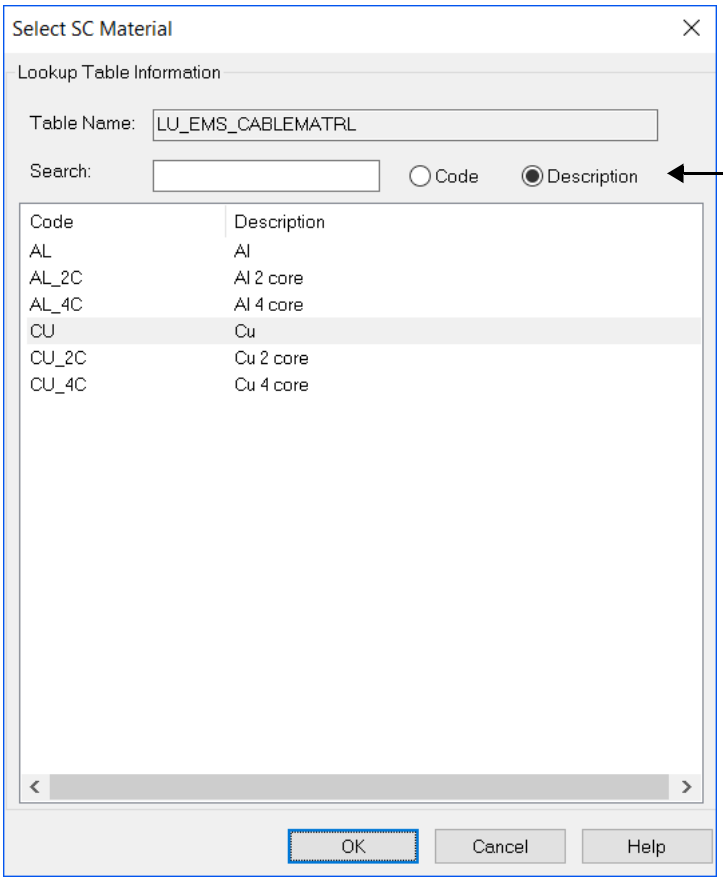


Figure 12 The Select SC Material dialog box

3 Select the new material from the list, and then click **OK**.

The service connections are updated accordingly.

To change a service phase

1 Choose **Change** > **SC Attribute** > **Change Service Phase...**

2 Select the service connection/s that you want to change, and then press **ENTER**.

3 The **Service Connection Information** dialog box is displayed.

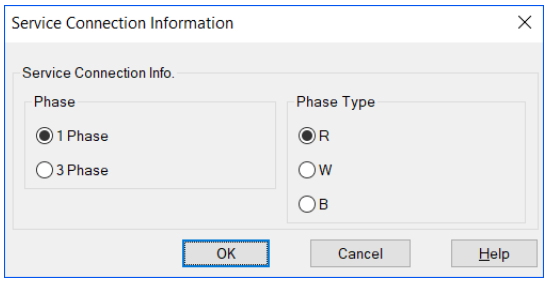


Figure 13 The Service Connection Information dialog box

4 Change the phase and phase type as required, and then click **OK**.

To link service connections to parcels

1 Choose **Change** > **SC Attribute** > **Link Service Connections**.

2 Select the appropriate service connections, and then press **ENTER**.

The selected service connections are linked to their respective parcels and buildings.

Note:

If the endpoint of the service connection falls inside a parcel boundary the PRCL_GID column is updated with the GID value from SP_PARCEL.

If the endpoint of the service connection falls inside a parcel boundary and a building polygon the PRCL_GID column is updated with the GID value from SP_PARCEL, and the LINK_ID column is updated with the GID value from SP_BUILDING

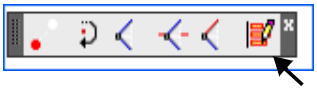
Changing electricity notes

With this function, you can change the text of electricity notes, using the Electricity Note text box.

To change an electricity note

1 Do one of the following:

- Choose **Change** > **Change Electricity Note**.
- Click the **Change Electricity Note** button on the Munsys Electricity **Change** toolbar.



2 Select the electricity note that you want to change

The Electricity Note text box is displayed.

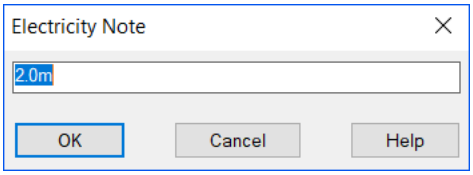


Figure 14 The Electricity Note text box

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 electricity objects.

To add comments

1 Choose **Change** > **Add Comment...**

2 Select the electricity object(s) that you want to add a comment to.

The Electricity Comment text box is displayed.

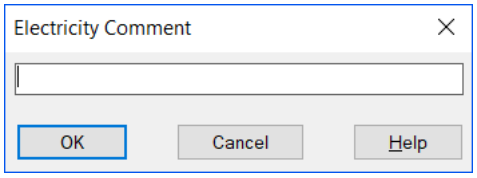


Figure 15 The Electricity Comment text box

3 In the text box, add the comment, and then click **OK**.

The comment is assigned to the selected object(s).

Deleting and undeleting electricity objects

With Munsys Electricity, existing electricity objects can be deleted from the database. Multiple objects can be selected for deleting. Electricity objects that form part of a redundant network have to be deleted. Deleted electricity 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 electricity objects that have been moved to the DELETED layer and that are marked for deletion.

To delete electricity objects

1 Choose **Change** > **Delete Electricity Object**.

2 Select the electricity objects that you want to delete.

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

3 Press **ENTER** to delete the selected electricity objects.

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

To undelete electricity objects

With this function, you can restore electricity objects that have been moved to the DELETED layer and that are marked for deletion.

1 Choose **Change** > **Undelete Electricity Objects**.

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

2 Select the electricity objects that you want restored.

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.

Index

A

adding comments 5- 81
additional reading material 1- 2
attribute data, capturing 4- 47

C

capture settings 4- 27
capture toolbar 2- 8
capturing electricity data 4- 26
change toolbar 2- 9
comments, adding 5- 81
connectivity toolbar 2- 13
converting blocks to nodes 4- 65
converting lines to electricity objects 4- 65
converting polygons to electricity zones 4- 65
converting text to notes or tags 4- 65

D

database
  posting electricity data to 4- 58
database, connecting to 2- 5
deleting electricity objects 5- 82
dimensions 2- 14
direct OH SC at 45 or 90 degrees, placing 4- 38
direct UG SC at 45 or 90 degrees, placing 4- 42
direction arrows, clearing 4- 45
ducts
  capturing 4- 46

E

editing attributes 5- 67
electricity cable direction, changing 4- 45
electricity cable direction, showing 4- 44
electricity cables
  cable types 4- 32
  capturing 4- 32
  changing 5- 74
  changing cable material 5- 76
  changing cable size 5- 75
  changing cable status 5- 76
  changing cable vertex 5- 74
  inserting vertex 5- 74
  querying 3- 21
  reconnecting 5- 77
electricity cables 2- 14
electricity data status report, generating 4- 63
electricity data, modifying 5- 66
electricity duct dialog box 4- 46
electricity ducts
  capturing 4- 46
  placing 4- 46
  querying 3- 24
electricity ducts 4- 46
electricity integrity
  browsing integrity markers 4- 57
  checking network integrity 4- 56
  checking object integrity 4- 55
  erasing integrity markers 4- 58
electricity network 4- 25
electricity network quality reporting 4- 61
electricity nodes
  capturing 4- 29
  changing 5- 72
  changing description 5- 73
  changing node group 5- 73
  inserting 4- 31
  moving 5- 72

node types 4- 29
querying 3- 20
resetting a node 5- 74
rotating by 180 degrees 5- 73
electricity nodes 2- 14
electricity notes
changing 5- 80
placing 4- 48
querying 3- 24
electricity notes 2- 14
electricity objects, about 2- 14
electricity settings dialog box 4- 27
electricity zones
capturing 4- 50
drawing boundary 4- 50
generate polygons 4- 51
place tag 4- 50
querying 3- 23
electricity zones 2- 14

F

freehand electricity cable, placing 4- 35
freehand OH SC, placing 4- 38
freehand UG SC, placing 4- 41

I

insert node toolbar 2- 10
integrity check
integrity markers 4- 57
integrity check 4- 52
integrity markers, browsing 4- 57
integrity markers, erasing 4- 58
integrity markers, locating errors 4- 57

L

linked table attributes, editing 5- 71

M

Munsys Electricity
interface 2- 7
launching 2- 5, 6

N

node reference, attaching 4- 47

O

offset electricity cable, placing 4- 34
offset UG SC, placing 4- 39
overhead electricity cables, capturing 4- 33

P

phase type 4- 37
place freehand UG cable toolbar 2- 12
place node toolbar 2- 9
place offset UG cable toolbar 2- 11
place OH cable toolbar 2- 11
place SC toolbar 2- 12

Q

queries
querying all electricity objects 3- 17
querying electricity network objects 3- 20
querying electricity objects by category 3- 19

R

radial SC OH, placing 4- 39
radial SC UG, placing 4- 43

S

service connection info check box 4- 37
service connections
changing 5- 77
changing material 5- 78
changing service phase 5- 79
changing size 5- 77
querying 3- 22
service connections 2- 14
service connections, capturing 4- 37

U

undeleting electricity objects 5- 82
underground elec. cables, capturing 4- 34

underground service connections, placing 4- 39