
Chapter 4 –Traffic Engineering (TED) Standards

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Chapter 4

4.1 Creating Traffic Control Device Plans

4.1.1 Introduction

This Chapter describes procedures for creating Traffic Control Device (TCD) plans using MicroStation for the Virginia Department of Transportation (VDOT). The user should refer to VDOT's Traffic Engineering Design Manual for details on the preparation of TCD plans.

VDOT TCD Plans are developed using a combination of a 'master design' file and 'sheet' files. All TCD plans should be completed in 2D and developed by referencing CADD files from other design disciplines (roadway design, right of way, hydraulics, survey, etc.) into a master design file. A master design file is created for each type of TCD plan set required for the project (such as lighting, pavement markings, signals, signing and ITS). Individual sheet files are created for each plan sheet by referencing the master design file and the other design disciplines files.

The following directory structure should be used for all 't' directories in Falcon/DMS.

```
UPC#\  
  t + UPC#\  
    Lighting\  
    PaveMark\  
    Signals\  
    Signing\  
    ITS\  
  
```

The overall TCD plan development outline is as follows:

- [4.1.2](#) Create Master Design Files and Attach all Required References
- [4.1.3](#) Create the Individual Sheet Files
- [4.1.5.1](#) Reference the Traffic Master Design File and Other Reference Files, Rotate the View of the Sheet File, and Insert the Border Cell into the Sheet File
- [4.1.6](#) Complete the TCD Design in the Master Design File
- [4.1.7](#) Add Labels, Notes, and Other Non-Design Elements in the Sheet File

4.1.2 Create Master Design Files and Attach all Required References

The master design file must be kept intact as the TCD design file for inputting all design items throughout the life of the project. All proposed TCD equipment that is necessary to complete the TCD designs should be located in the master design file. Most, if not all of these items can be found in the TED cell libraries. **No annotations, text, or call-outs for design items should be placed in a master design file.** All annotations, text, or call-outs for design items should be placed in the sheet file along with notes, special symbols, reference notations, symbol legends, and the sheet border.

4.1.2.1 File Creation Instructions

1. All users must use [SARA](#) (VDOT's System Access Request Application) to request access to each project. Users will be notified once access is given.
2. The user should specify the appropriate traffic sub-folders to be added to Falcon/DMS (see 4.1.1 Introduction). These sub-folders will depend on the scope of TCD design work required for the project.
3. Once Falcon/DMS access has been obtained, open **Falcon/DMS Document Manager** by double clicking on the Falcon Icon or by clicking on 'Falcon/DMS' in the MicroStation menu bar.
4. Click on '**Database**' in the **Falcon/DMS Menu bar** and select '**Open Database**'.
5. Select the correct database from the pop-up window and click 'Open'.

Note: For Internal VDOT only – There are multiple environments in the Central Office Database. Make sure the correct environment is selected by clicking on 'Environments' in the Falcon/DMS Menu bar and making a selection.

6. Click on the 'Projects' folder and select the appropriate project folder based on the UPC#.
7. Expand the project folder. There should be a folder named '**t + UPC#**'.
(For example: if the UPC# is 15234. There should be a folder named **t15234**.)
8. Double click on the 't' folder.

9. The traffic sub-folders requested on the access form (see step 1) should be located in this directory. Potential sub-folders include:
 - a. Lighting
 - b. PaveMark
 - c. Signals
 - d. Signing
 - e. ITS

10. Click on the sub-folder where the user wants to create the file. Then click on 'File' in the Falcon/DMS menu bar and highlight 'New' and then select '**IGDS Document**'.

11. The '**New Document**' window will pop-up with the '**Templates**' tab selected. In this window the user now will select the appropriate seed file. TCD plans only use one of the following seed files:
 - For a project using Imperial units – Select geopakdes.dgn
 - For GuidSign Files – Select guidesign.dgn

12. After highlighting the correct seed file, click '**Next**'. The 'Properties' tab will now be shown.

The top section of the window contains fields for the 'Filename' and 'Sheet #'. There are four separate tabs in the bottom half of the window:

1. General Info
2. Keywords
3. File Format Keywords
4. Title Block

For the top section of the window and the 'General Info' tab in the bottom half of the window use the table below to fill in the 'Filename', 'Sheet #', and 'Description'. All master design file naming should follow the convention set forth in the table below and on the following page.

Master Design File Naming Convention for TCD Plans				
TCD Discipline	File Type	Falcon/DMS DocMan Field Inputs		
		Filename	Sheet #	Description
Lighting	Master Design	t + UPC# + LT.dgn	LT MASTER	Lighting Master Design File
Pavement Markings	Master Design	t + UPC# + PM.dgn	PM MASTER	Pavement Marking Master Design File

Master Design File Naming Convention for TCD Plans				
TCD Discipline	File Type	Falcon/DMS DocMan Field Inputs		
		Filename	Sheet #	Description
Signals	Master Design	t + UPC# + TS.dgn	TS MASTER	Traffic Signal Master Design File
	Existing Signal Layout (See Note)	t + UPC# + TSx.dgn	EXISTING TS	Existing Traffic Signal Layout
Signing	Master Design	t + UPC# + SI.dgn	SI MASTER	Signing Master Design File
ITS/TMS	Master Design	t + UPC# + TM.dgn	TM MASTER	ITS/TMS Master Design File

Note: The Existing Signal Layout should be located in the 't + UPC# \ Signals' folder.

The 'Status' pull-down menu under the '**General Info**' tab should set to '**Active**' for all files.

For the '**Keywords**' tab the following information should be inputted:

- a. Route – This item should be four digits with leading zeros as needed.
- b. County/City
- c. Section – This is the last three digits of the state project number
- d. C # or M#, etc. – For example C501, C502, etc.

For the '**File Format Keywords**' tab the following information should be inputted:

- a. Engineer
- b. Designer
- c. District
- d. County
- e. Generate PDF – This should be 'Current Drawings' when the files are first set-up.
- f. Unit/Measure
- g. Scale Factor – Select the appropriate locality.

Then Click **Next**.

13. After clicking 'Next', the '**Summary**' tab will be shown. Review all of the information that was inputted in Step 11 and revise any incorrect information. At the bottom the user has three options.
 1. Create Document – This creates the document and leaves it on the server.
 2. Create/Checkout Document – This creates the document and places it on the user's local machine.
 3. Create/Open Document – This creates the document and then opens the file.

Select one of the options and then click **Finish**.

All of the master design files for each TCD discipline required on the project should be created and located in the proper sub-folders.

t + UPC# + LT.dgn – Lighting Master Design File

Located in t + UPC#\Lighting\

t + UPC# + PM.dgn – Pavement Marking Master Design File

Located in t + UPC#\PaveMark\

t + UPC# + TS.dgn – Traffic Signal Master Design File

Located in t + UPC#\Signals\

t + UPC# + TSx.dgn – Existing Traffic Signal Layout File

Located in t + UPC#\Signals\

t + UPC# + SI.dgn – Signing Master Design File

Located in t + UPC#\Signing\

t + UPC# + TM.dgn – ITS\TMS Master Design File

Located in t + UPC#\ITS\

4.1.2.2 Attach Reference Files

Follow the steps listed below to attach all of the required reference files.

14. '**Open (Modify)**' the appropriate traffic engineering master design file. If option 3 in step 12 was chosen this step is not necessary.
15. Then in Falcon/DMS, highlight the roadway design file required for the TCD plan (typically located in the 'd + UPC#' folder). This file will be one of the reference files necessary to complete the TCD design.

16. Click '**MicroStation**' in the Falcon/DMS menu bar and select 'Attach Reference'.
17. In MicroStation, the '**Attach Reference**' window will appear. Ensure the following information is shown, if not input or modify as needed:

Logical Name – Design - Roadway
Description – Leave this blank
Orientation – Select 'Coincident – Aligned with Master File'
Scale (Master:Ref) – 1.000 : 1.000
Nested Attachments – Select 'Copy Attachments', Depth of 1

18. Click OK

All of the reference files that were attached to the master roadway design file should now be attached to the master traffic design file. The user should verify that all reference files were attached.

19. Review all of the attached files. Detach files that are not required and attach any additional files that are required to complete the traffic engineering design. Also, ensure that the corresponding roadway design sheet file(s) are attached.
20. Modify the 'Logical Name' and 'Description' for each reference file. The table below provides a couple of examples of 'Logical Names' to be used with other design discipline's reference files. All reference files that are attached should have information placed in the 'Logical Name' field to provide users with a clear understanding of the reference file's purpose in the design.

The 'Logical Name' field is also used during plotting to screen certain reference files to assist with plan legibility. The 'Logical Name' needs to be typed in exactly as shown below in order for the plotting to work correctly. The 'Description' for each reference file should be left blank.

Reference Files & Logical Names		
File Name	Logical Name	Comments
d + UPC#.dgn	Design - Roadway	
d + UPC#.dgn	Design - Roadway 2	Use if multiple roadway design files exist.
d + UPC#.dgn	Design - Roadway 3	Use if multiple roadway design files exist.
s + UPC#.dgn	Survey	
h + UPC#.dgn	Design - Drainage	
t + UPC# + pm.dgn	PM Master	
t + UPC# + pm.dgn	Shade PM Master	This logical name should be used if the designer is referencing the pavement markings file into the signal sheet file.

Although discouraged, a master design file can be used by multiple users. This requires close coordination between the various files and users. When several users need to develop their design in a master file, the recommended way to accommodate this is create multiple uniquely named master design files. It is critical that each of these files have a unique file name. This can be done by adding a qualifier to the end of the file name, such as an 'a' (t15234TSa.dgn). Each uniquely named master design file shall be copied into a single master design file before submittals. All sheet files should only reference the single master design file. Once the files have been combined into a single master design file, all uniquely named master design files should be deleted.

4.1.3 Create the Individual Sheet Files

The sheet files contain non-design related items, such as annotations/text/call-outs, notes, special symbols, reference notations, symbol legends and the sheet border. The master TCD design file and all other necessary reference files shall be attached to the sheet file.

All TCD plans shall utilize the Clip Bound procedure for the clipping of reference files. Refer to [Appendix D](#) of this manual for attaching reference files and the Clip Bound procedure. The clip boundaries should be placed into the sheet file using the proper level and symbologies shown in the manual.

Create the individual sheet files for each TCD discipline using steps 1 – 12 listed in section 4.1.2.

The file naming convention shown on the following pages should be used for sheet files.

4.1.4 Sheet File Naming Convention for TCD Plans

TCD Discipline	File Type	Sheet # On Plan (see Note 1)	Falcon/DMS DocMan Input Fields		
			Filename (see Note 4)	Sheet # (see Note 4)	Description
Lighting	Plan Index, General Notes & Legend	LT(1)	t + UPC# + LT(01).dgn	LT(01)	Lighting – Plan Index, General Notes & Legend
	Insertable Sheet(s)	LT(1A)1, LT(1A)2, LT(1A)3,	t + UPC# + LT(01A)1.dgn, t + UPC# + LT(01A)2.dgn, t + UPC# + LT(01A)3.dgn,	LT(01A)1, LT(01A)2, LT(01A)3,	Lighting – Insertable Sheets
	Summary of Quantities	LT(2)1, LT(2)2, LT(2)3,	t + UPC# + LT(02)1.dgn, t + UPC# + LT(02)2.dgn, t + UPC# + LT(02)3.dgn,	LT(02)1, LT(02)2, LT(02)3,	Lighting – Summary of Quantities
	Luminaire and Pole Detail(s)	LT(2A)1, LT(2A)2, LT(2A)3,	t + UPC# + LT(02A)1.dgn, t + UPC# + LT(02A)2.dgn, t + UPC# + LT(02A)3.dgn,	LT(02A)1, LT(02A)2, LT(02A)3,	Lighting – Luminaire and Pole Details
	Panel Detail(s)	LT(2B)1, LT(2B)2, LT(2B)3,	t + UPC# + LT(02B)1.dgn, t + UPC# + LT(02B)2.dgn, t + UPC# + LT(02B)3.dgn,	LT(02B)1, LT(02B)2, LT(02B)3,	Lighting – Panel Details
	Underbridge Lighting System Detail(s)	LT(2C)1, LT(2C)2, LT(2C)3,	t + UPC# + LT(02C)1.dgn, t + UPC# + LT(02C)2.dgn, t + UPC# + LT(02C)3.dgn,	LT(02C)1, LT(02C)2, LT(02C)3,	Lighting – Underbridge Lighting System Details
	Sheet File(s) (see Note 2)	LT(3), LT(4), LT(5),	t + UPC# + LT(03).dgn, t + UPC# + LT(04).dgn, t + UPC# + LT(05).dgn,	LT(03), LT(04), LT(05),	Lighting Sheet File – Sta. XX+XX to Sta. XX+XX

TCD Discipline	File Type	Sheet # On Plan (see Note 1)	Falcon/DMS DocMan Input Fields		
			Filename (see Note 4)	Sheet # (see Note 4)	Description
Pavement Markings (see Note 3)	Plan Index, General Notes & Legend	PM(1)	t + UPC# + PM(01).dgn	PM(01)	Pavement Markings – Plan Index, General Notes & Legend
	Insertable Sheet(s)	PM(1A)1, PM(1A)2, PM(1A)3,	t + UPC# + PM(01A)1.dgn, t + UPC# + PM(01A)2.dgn, t + UPC# + PM(01A)3.dgn,	PM(01A)1, PM(01A)2, PM(01A)3,	Pavement Markings – Insertable Sheets
	Pavement Marking Detail(s)	PM(1B)1, PM(1B)2, PM(1B)3,	t + UPC# + PM(01B)1.dgn, t + UPC# + PM(01B)2.dgn, t + UPC# + PM(01B)3.dgn,	PM(01B)1, PM(01B)2, PM(01B)3,	Pavement Marking Details
	Summary of Quantities	PM(2)1, PM(2)2, PM(2)3,	t + UPC# + PM(02)1.dgn, t + UPC# + PM(02)2.dgn, t + UPC# + PM(02)3.dgn,	PM(02)1, PM(02)2, PM(02)3,	Pavement Markings – Summary of Quantities
	Sheet File(s) (see Note 2)	PM(3), PM(4), PM(5),	t + UPC# + PM(03).dgn, t + UPC# + PM(04).dgn, t + UPC# + PM(05).dgn,	PM(03), PM(04), PM(05),	Pavement Markings Sheet File – Sta. XX+XX to Sta. XX+XX
Signals	Plan Index, General Notes & Legend	TS(1)	t + UPC# + TS(01).dgn	TS(01)	Traffic Signal – Plan Index, General Notes & Legend
	Insertable Sheet(s)	TS(1A)1, TS(1A)2, TS(1A)3,	t + UPC# + TS(01A)1.dgn, t + UPC# + TS(01A)2.dgn, t + UPC# + TS(01A)3.dgn,	TS(01A)1, TS(01A)2, TS(01A)3,	Traffic Signal – Insertable Sheets
	Summary of Quantities	TS(2)1, TS(2)2, TS(2)3,	t + UPC# + TS(02)1.dgn, t + UPC# + TS(02)2.dgn, t + UPC# + TS(02)3.dgn,	TS(02)1, TS(02)2, TS(02)3,	Traffic Signal – Summary of Quantities
	Sign Figure Detail(s)	TS(2A)1, TS(2A)2, TS(2A)3,	t + UPC# + TS(02A)1.dgn, t + UPC# + TS(02A)2.dgn, t + UPC# + TS(02A)3.dgn,	TS(02A)1, TS(02A)2, TS(02A)3,	Traffic Signal – Sign Figure Details
	Sheet File(s)	TS(3), TS(4), TS(5),	t + UPC# + TS(03).dgn, t + UPC# + TS(04).dgn, t + UPC# + TS(05).dgn,	TS(03), TS(04), TS(05),	Signal Sheet File – ‘Intersection Name’ (Plan Sh. #)

TCD Discipline	File Type	Sheet # On Plan (see Note 1)	Falcon/DMS DocMan Input Fields		
			Filename (see Note 4)	Sheet # (see Note 4)	Description
Signing (see Note 3)	Plan Index, General Notes & Legend	SI(1)	t + UPC# + SI(01).dgn	SI(01)	Signing – Plan Index, General Notes & Legend
	Insertable Sheet(s)	SI(1A)1, SI(1A)2, SI(1A)3,	t + UPC# + SI(01A)1.dgn, t + UPC# + SI(01A)2.dgn, t + UPC# + SI(01A)3.dgn,	SI(01A)1, SI(01A)2, SI(01A)3,	Signing – Insertable Sheets
	Summary of Quantities	SI(2)1, SI(2)2, SI(2)3,	t + UPC# + SI(02)1.dgn, t + UPC# + SI(02)2.dgn, t + UPC# + SI(02)3.dgn,	SI(02)1, SI(02)2, SI(02)3,	Signing– Summary of Quantities
	Sign Figure Detail(s)	SI(2A)1, SI(2A)2, SI(2A)3,	t + UPC# + SI(02A)1.dgn, t + UPC# + SI(02A)2.dgn, t + UPC# + SI(02A)3.dgn,	SI(02A)1, SI(02A)2, SI(02A)3,	Signing – Sign Figure Details
	Sign Schedule(s) for Proposed Signs	SI(2B)1, SI(2B)2, SI(2B)3,	t + UPC# + SI(02B)1.dgn, t + UPC# + SI(02B)2.dgn, t + UPC# + SI(02B)3.dgn,	SI(02B)1, SI(02B)2, SI(02B)3,	Signing – Sign Schedule for Proposed Signs
	Sign Schedule(s) for Existing Signs to be Relocated	SI(2C)1, SI(2C)2, SI(2C)3,	t + UPC# + SI(02C)1.dgn, t + UPC# + SI(02C)2.dgn, t + UPC# + SI(02C)3.dgn,	SI(02C)1, SI(02C)2, SI(02C)3,	Signing – Sign Schedule for Existing Signs to be Relocated
	Type VIA & Non-Standard VA Sign Structure Detail(s)	SI(2D)	t + UPC# + SI(02D).dgn	SI(02D)	Signing – Type VIA & Non-Standard VA Sign Structure Details
	Overhead Sign Structure Elevation Detail(s)	SI(2E)1, SI(2E)2, SI(2E)3,	t + UPC# + SI(02E)1.dgn, t + UPC# + SI(02E)2.dgn, t + UPC# + SI(02E)3.dgn,	SI(02E)1, SI(02E)2, SI(02E)3,	Signing – Overhead Sign Structure Elevation Details
	Sheet File(s) (see Note 2)	SI(3), SI(4), SI(5),	t + UPC# + SI(03).dgn, t + UPC# + SI(04).dgn, t + UPC# + SI(05).dgn,	SI(03), SI(04), SI(05),	Signing Sheet File – Sta. XX+XX to Sta. XX+XX
ITS/TMS	Sheet File(s)	TM(3)	t + UPC# + TM(03).dgn	TM(03)	ITS/TMS Sheet File – Sta. XX+XX to Sta. XX+XX

Notes:

1. If the series number is known for the TCD discipline, replace the two letter code (LT, PM, TS, SI, or TM) with the series number (ex. 06, 10, 20, etc.).
2. The plan sheet number should correspond to the roadway design plan sheets for all TCD sheet files except for signal plans.

3. If the signing and pavement markings are combined into the same sheet file (the preferred method), those files should be stored in the 'Signing' sub-folder and utilize the signing file naming convention. However, the pavement marking master design file and, if used, the pavement marking insertable sheets and pavement marking details should be stored in the 'PaveMark' sub-folder and follow the pavement marking file naming convention. A single 'Plan Index, General Notes & Legend' sheet and a single 'Summary of Quantities' sheet should be utilized.
4. If the series number is known for the TCD discipline, replace the two letter code (LT, PM, TS, SI, or TM) with the two digit series number (ex. 06, 10, 20, etc).

The sheet files for each TCD discipline required for the project have now been created. Verify that all files are located in the proper sub-folders as indicated below.

For Lighting

All sheet files should be located in t + UPC#\Lighting

For Pavement Markings

All sheet files should be located in t + UPC#\PaveMark

For Signals

All sheet files should be located in t + UPC#\Signals

For Signing

All sheet files should be located in t + UPC#\Signing

For combined Signing and Pavement Marking plans

All sheet files should be located in t + UPC#\Signing

For ITS\TMS

All sheet files should be located in t + UPC#\ITS

4.1.5 Final Stages for TCD Plan Sheets

4.1.5.1 Referencing the necessary Traffic Files

To reference the Traffic Master Design File and other reference files, Rotate the view of the Sheet File, and insert the Border Cell into the Sheet File

1. Open (Modify) the appropriate traffic engineering sheet file.
2. Then in Falcon/DMS, highlight the appropriate traffic engineering master design file.
3. Click 'MicroStation' in the Falcon/DMS menu bar and then click 'Attach Reference'.
4. In MicroStation, the 'Attach Reference' window will appear. Ensure the following information is shown, if not input or modify as needed

Logical Name – XX Master Design

Where XX equals:

LT for Lighting

PM for Pavement Markings

TS for Signals

TS - Prelim for Preliminary Signals

SI for Signing

TM for ITS/TMS

Description – Leave this blank

Orientation – Select ‘Coincident – Aligned with Master File’

Scale (Master:Ref) – 1.000 : 1.000

Nested Attachments – Select ‘Copy Attachments’, Depth of 1

5. Click OK
6. Ensuring that the corresponding roadway sheet file is also attached and all reference files have information in the ‘Logical Name’ column.
7. Rotate the view to align with the roadway design sheet.
8. Copy the north arrow from the roadway design file.
9. Insert the standard VDOT border cell. The TED Border Cell Library contains additional border cells that are required for TCD Plans. See section 4.5 of this chapter for discussion on the cell libraries.

This procedure should be repeated to create each individual sheet file required for the project.

A majority of incidental information should be removed from all reference files attached to the sheet file by turning levels off within individual reference files as well as using the clip mask & clip boundary commands. In addition, all plots should have the base sheet information shown screened to a lighter shade of gray than the proposed design information.

4.1.6 Complete the TCD Design in the Master Design File

See the [Traffic Engineering Design Manual](#).

4.1.7 Add Labels, Notes, and Other Non-Design Elements in the Sheet File

See the [Traffic Engineering Design Manual](#).

4.2 GuidSIGN

The following instructions are for creating non-standard MUTCD signs using GuidSIGN.

For more detailed information on sign usage and design refer to the [TED Manual](#), Section II – Signing.

4.2.1 Create a new file

Follow the steps in [Section 4.1.2](#) and select **guidesign.dgn** for the seed file. Continue following the steps in Section 4.1.2. All non-standard signs for the project should be created in this file.

4.2.2 File Naming Convention

All GuidSIGN files shall utilize the following naming convention:

TCD Discipline	File Type	Falcon/DMS DocMan Input Fields		
		Filename	Sheet #	Description
Signing	Sign Design	t + UPC# + SIFIG.dgn	N/a	GuidSign Design File

4.2.3 Loading the Program

From the VDOT Tasks menu, click on **'Guidsign'** in the traffic toolbar. If the VDOT menu is not available, then, from the Microstation menu bar, click on **'Utilities'** and then select **'MDL Applications'**. Scroll through the 'Available Applications' list and select 'gsV8i.ma'. If 'gsV8i' is not listed, then click **'Browse'**. The user will have to navigate to the location where the GuidSIGN application has been loaded onto the machine or server. Typically, the file is located in: C:\Program Files\Transoft Solutions\GuidSIGN 5\

4.2.4 Program Settings

Use the **'Set/Create Panel Style'** to select panel style and set the desired values for text height, line spacing, font, border width, border radius, etc.

4.2.5 Create a New Border

The **'Place New Panel'** icon is the third icon on the GuidSIGN tool palette. Click on the rectangular shaped icon and 'Place New Panel' window will appear on the screen. Make any changes to values and click Apply, then click on screen for a blank sign panel to appear.

4.2.6 Text String

Place text string in the sign layout by selecting the fourth icon on the GuidSIGN tool palette (the symbol that looks like the letter 'A'). The '**Place Highway Text**' tool box will appear. Type the text that is desired for that line of copy and select the OK button.

4.2.7 Placing Cells

Use the cell icons to locate cells, arrows, route shields and other symbols in relation to each other. Use the '**Move Single Object**' and the '**Move Multiple Objects**' icons to precisely align objects in sign panel.

4.2.8 Place Drawing Sheet and Report

Create a sign layout drawing showing the location of each letter and the size and location of each symbol.

4.3 AGI 32

4.3.1 Creating lighting plans

VDOT requires all roadway lighting designs to meet the current IESNA publication, Recommended Practices for Roadway Lighting RP-8-00. The VDOT sanctioned AGI32 lighting design software produces on a plan view drawing the required iso-footcandle / lighting calculations for the determination of pole locations. The plan view drawing can be drawn manually using commands within AGI32 or the drawing can be imported from an existing MicroStation file via DXF transfer. The following basic instructions are for creating lighting plans from an existing MicroStation file:

For more detailed information on Lighting usage refer to the (TED) [Traffic Engineering Design Manual](#), Section V – Roadway Lighting.

4.3.1.1 Exporting file from MicroStation

Select the **File – Export – DGN, DWG, DXF ...** and then the Export file window will appear.

- Select the directories
- Select name
- Select file type, must be AutoCAD DWG or DXF Files
- Click OK

4.3.1.2 Create a New File in AGI32

Select **Start – All Programs – Lighting Analysts – AGI32-v1dot9**. AGI32 will open with a Welcome window. Read the text and then close the window. The Calculation window will then appear; the user should select the “Direct Calculation Mode” and click OK.

4.3.1.3 Import File to AGI32

To import a file from MicroStation into AGI, Select **File – Import**. The Import File window will then appear. The user must navigate to the appropriate MicroStation Design File (must be in DXF format) and click OK.

The Import CAD File window will appear:

- Select the layers
- Select the units

Click OK and the Import CAD File with file name screen will appear, click OK. The base drawing should appear on the screen.

- Verify correct DWG scale
- Verify the units (Zoom window on a portion of drawing and measure)

4.3.1.4 Place Calculation Points

Once the drawing background is in place, select the **CalcPts-Polygon** button from the Calc Points toolbar. The Calculation Points – Polygon window will appear. Click in the Label cell and type a name for this grid of points. (This command allows the creation of a grid of computation points within the boundary of a polygon that is delineated).

Click OK.

- Locate the first point of the grid.
- Locate the second point of the grid and so on.
- When the last point has been selected, right click to create the grid.

4.3.1.5 Define a Luminaire

Click on the **Define Luminaire** button on the Define Luminaire toolbar. The Define Luminaire dialog will appear. Select the **photometric** files required for this project.

- The Smart Symbols screen will appear. Select the **Mounting Type** and click OK.
- The Define Luminaire dialog will appear; click in the **Label cell** and type a simple identifier for the luminaire.
- Click in Description cell and type more specific information about the luminaire.
- Click on Total Watts cell and type the lamp wattage.
- Adjust the lighting factors as shown below to generate the correct Light Loss Factor (LLF) for each type of lighting standard:

Light Loss Factors				
Lighting Standard	LLD	LDD	BF	LLF
Conventional	0.8	0.85	0.95	0.65
Offset	0.8	0.85	0.95	0.65
High mast	0.8	0.95	0.95	0.72
Architectural	0.8	0.95	0.95	0.72

- Click in the **Arrangement cell** and select the Arrangement type.
- Click in the **Arm Length cell** and type the Arm length.
- Click on the **Add/Redefine button** on the right side of the dialog and then close the window.
- Click on the **MH cell** on the Lum Define toolbar and type Mounting Height.
- Click on the **Orient cell** and type the Orientation Angle.
- Click on the **Tilt cell** and type the Tilt Angle.

4.3.1.6 Locate the Luminaires

Once the luminaires are defined, they can be located on the drawing. Click on the **Add Luminaire Location** button on the Luminaire toolbar. The Luminaire symbol will be attached to the cursor and the user will be able to place the luminaries interactively on the drawing.

- First click positions the pole.
- Second click determines the orientation.

Each subsequent click of the left mouse button will locate a luminaire on the drawing. Once all the luminaires are located, click the right mouse button to terminate the command.

4.3.1.7 Lighting Calculations

Click on the **Calculate Now** button on the toolbar (the calculator icon) to commence processing; results will then be displayed.

4.3.1.8 Export File

In order to export the file from AGI32 to MicroStation, Select **File – Export** and the Export File window will appear. The user must navigate to the appropriate directory and name the file then click OK.

- The Export DXF file dialog will appear; Select a scaling factor and then click OK.

4.3.1.9 Import the AGI32 file into MicroStation

In order to import the AGI32 file into MicroStation, the user must open MicroStation V8. Select **File – Open** and navigate to the appropriate directory, select '**CAD Files**' under '**List Files of Type**', then select the file and click OK.

Place the appropriate lighting symbol according to the lighting legend on the top of AGI luminaire locations and then remove the AGI Export file from the lighting plans

4.3.1.10 Create Roadway Lighting Layout

Create a lighting layout drawing showing the pole locations, conduit runs, junction boxes, power source locations and label all conduit runs and all symbols.

4.4 TED Level Structure

NOTE: All elements' style, weight and color shall be set to *ByLevel* unless otherwise noted.

Level	Description
Traffic – General	
TRAF_GN_SHT_ALL_NAME	Name in Top Right of Border
TRAF_GN_SHT_ALL_TITLE	Title Block in bottom right of sheet
TRAF_GN_SHT_ALL_CTY	City / County Label
TRAF_GN_SHT_ALL_LOGO_CON	Consultant Logo
TRAF_GN_SHT_ALL_LOGO_COTED	VDOT TED Logo
TRAF_GN_SHT_ALL_LOGO_OTHER	Other Logo
TRAF_GN_SHT_ALL_MISC	Miscellaneous Items
TRAF_GN_SHT_ALL_MS	Milestone Stamps
TRAF_GN_DES_ALL_SNAP_DESC	Design File - Description of Snap Points
TRAF_GN_DES_ALL_SNAP_PT	Design File - Snap Points
TRAF_GN_SHT_ALL_SNAP_DESC	Sheet File - Description of Snap Points
TRAF_GN_SHT_ALL_SNAP_PT	Sheet File - Snap Points
TRAF_GN_SHT_SHT1_IOS	Index of Sheets
TRAF_GN_SHT_SHT1_GNOTE	General Notes
TRAF_GN_SHT_PS_DA	Directional Arrows
TRAF_GN_SHT_PS_DIM	Dimensions
TRAF_GN_SHT_PS_PN	Plan Notes
TRAF_GN_SHT_PS_ROAD	Roadway Names

Level	Description
TRAF_GN_SHT_PS_RW LABEL	Proposed R/W Labels and Leaders for TCD Equipment
Traffic – Summary of Quantities	
TRAF_GN_SHT_SQ_TABLE	Table
TRAF_GN_SHT_SQ_INFO	Information
TRAF_GN_SHT_SQ_MISC	Miscellaneous
Pavement Marking	
TRAF_EX_DES_PM_ARR	Existing Arrows
TRAF_EX_DES_PM_HATCH	Existing Hatching
TRAF_EX_DES_PM_LINE	Existing Longitudinal
TRAF_EX_DES_PM_MARK	Existing Pavement Markers
TRAF_EX_DES_PM_MSG	Existing Message Markings
TRAF_EX_DES_PM_SYM	Existing Symbols, Text and Route Shields
TRAF_EX_DES_PM_TRANS	Existing Transverse (Stop Bars and Crosswalks)
TRAF_PR_DES_PM_ARR	Proposed Arrows
TRAF_PR_DES_PM_HATCH	Proposed Hatching
TRAF_PR_DES_PM_LINE	Proposed Longitudinal
TRAF_PR_DES_PM_MARK	Proposed Pavement Markers
TRAF_PR_DES_PM_MSG	Proposed Message Markings
TRAF_PR_DES_PM_SYM	Proposed Symbols, Text and Route Shields
TRAF_PR_DES_PM_TRANS	Proposed Transverse (Stop Bars and Crosswalks)

Level	Description
TRAF_PR_SHT_PM_LBL	Labels
TRAF_GN_SHT_PM_LEG_D	Legend - Descriptions
TRAF_GN_SHT_PM_LEG_T	Legend - Title
TRAF_GN_SHT_PM_MISC	Sheet File - Miscellaneous
TRAF_GN_DES_PM_LAYOUT	Layout
TRAF_GN_DES_PM_WORK1	Working Level 1
TRAF_GN_DES_PM_WORK2	Working Level 2
TRAF_GN_DES_PM_WORK3	Working Level 3
TRAF_GN_DES_PM_WORK4	Working Level 4
TRAF_GN_DES_PM_WORK5	Working Level 5
Signing	
TRAF_EX_DES_SI_FACE	Existing Faces, Leaders and Brackets
TRAF_EX_DES_SI_FACE_X	X for Existing to be Removed
TRAF_EX_DES_SI_GMSTR	Existing Ground Mounted Structures
TRAF_EX_DES_SI_OHSTR	Existing Overhead Structures
TRAF_PR_DES_SI_FACE_LEAD	Proposed Leaders and Brackets
TRAF_PR_DES_SI_FACE	Proposed Faces
TRAF_PR_DES_SI_GM_STP	Proposed GM Structure - STP-1
TRAF_PR_DES_SI_GM_VA	Proposed GM Structure - SSP-VA
TRAF_PR_DES_SI_GM_VIA	Proposed GM Structure - SSP-VIA
TRAF_PR_DES_SI_GM_WSP	Proposed GM Structure - WSP-1
TRAF_PR_DES_SI_GM_POLE	Proposed GM Sign Mounted on a Pole

Level	Description
TRAF_PR_DES_SI_GM_BW	Proposed GM Sign Mounted on a Barrier or Wall
TRAF_PR_DES_SI_GM_OTHER	Proposed GM Structure - Other
TRAF_PR_DES_SI_OHSTR	Proposed Overhead Structures
TRAF_EX_SHT_SI_LBL	Existing Labels
TRAF_PR_SHT_SI_LBL	Proposed Labels
TRAF_GN_SHT_SI_MISC	Sheet File - Miscellaneous
TRAF_GN_DES_SI_WORK1	Working Level 1
TRAF_GN_DES_SI_WORK2	Working Level 2
TRAF_GN_DES_SI_WORK3	Working Level 3
TRAF_GN_DES_SI_WORK4	Working Level 4
TRAF_GN_DES_SI_WORK5	Working Level 5
TRAF_GN_DES_SI_GSDIMS	GuidSign - Dimensions
TRAF_GN_DES_SI_GSSHT	GuidSign - Report and Report Text
TRAF_GN_DES_SI_GSTEXT	GuidSign - User placed text in Sign Figure Detail
TRAF_GN_DES_SI_GSOUTLINE	GuidSign - Signs (Outline)
TRAF_GN_DES_SI_GSBWFILL	GuidSign - Signs (Black and White - Filled)
TRAF_GN_DES_SI_GSCOLORFILL	GuidSign - Signs (Color - Filled)
TRAF_GN_DES_SI_GSWORK1	GuidSign - Working Level 1
TRAF_GN_DES_SI_GSWORK2	GuidSign - Working Level 2
TRAF_GN_DES_SI_GSWORK3	GuidSign - Working Level 3
TRAF_GN_DES_SI_GSWORK4	GuidSign - Working Level 4

Level	Description
TRAF_GN_DES_SI_GSWORK5	GuidSign - Working Level 5
Signals	
TRAF_EX_DES_TS_CON	Existing Conduit
TRAF_EX_DES_TS_JB	Existing Junction Box
TRAF_EX_DES_TS_MH	Existing Manhole
TRAF_PR_DES_TS_CON	Proposed Conduit
TRAF_PR_DES_TS_JB	Proposed Junction Box
TRAF_PR_DES_TS_MH	Proposed Manhole
TRAF_EX_DES_TS_CF	Existing Cabinet Foundations
TRAF_EX_DES_TS_PF	Existing Pole Foundations
TRAF_EX_DES_TS_LOOP	Existing Loops
TRAF_EX_DES_TS_VDZ	Existing Video Detection Zones
TRAF_PR_DES_TS_CF	Proposed Cabinet Foundations
TRAF_PR_DES_TS_PF	Proposed Pole Foundations
TRAF_PR_DES_TS_LOOP	Proposed Loops
TRAF_PR_DES_TS_VDZ	Proposed Video Detection Zones
TRAF_EX_DES_TS_MP	Existing Metal Pole
TRAF_EX_DES_TS_MA	Existing Mast Arm
TRAF_EX_DES_TS_SW	Existing Span Wire
TRAF_EX_DES_TS_CAB	Existing Cabinet and Controller
TRAF_EX_DES_TS_WP	Existing Wood Pole
TRAF_PR_DES_TS_MP	Proposed Metal Pole

Level	Description
TRAF_PR_DES_TS_MA	Proposed Mast Arm
TRAF_PR_DES_TS_SW	Proposed Span Wire
TRAF_PR_DES_TS_CAB	Proposed Cabinet and Controller
TRAF_PR_DES_TS_WP	Proposed Wood Pole
TRAF_EX_DES_TS_SH	Existing Signal Head
TRAF_EX_DES_TS_PA	Existing Pedestrian Actuation
TRAF_EX_DES_TS_SIGN	Existing Signal Related Sign
TRAF_EX_DES_TS_ANT	Existing Wireless Antenna
TRAF_EX_DES_TS_VDC	Existing Video Detection Camera
TRAF_EX_DES_TS_PRE	Existing Preemption Sensor
TRAF_EX_DES_TS_SE	Existing Electrical Service
TRAF_PR_DES_TS_SH	Proposed Signal Head
TRAF_PR_DES_TS_PA	Proposed Pedestrian Actuation
TRAF_PR_DES_TS_SIGN	Proposed Signal Related Sign
TRAF_PR_DES_TS_ANT	Proposed Wireless Antenna
TRAF_PR_DES_TS_VDC	Proposed Video Detection Camera
TRAF_PR_DES_TS_PRE	Proposed Preemption Sensor
TRAF_PR_DES_TS_SE	Proposed Electrical Service
TRAF_GN_SHT_TS_CHART	Charts and Diagrams
TRAF_GN_SHT_TS_LEGEND	Legends
TRAF_EX_SHT_TS_AG LBL	Existing Above Ground Labels
TRAF_PR_SHT_TS_AG LBL	Proposed Above Ground Labels

Level	Description
TRAF_EX_SHT_TS_UG_LBL	Existing Underground Labels
TRAF_PR_SHT_TS_UG_LBL	Proposed Underground Labels
TRAF_GN_SHT_TS_MISC	Sheet File - Miscellaneous
TRAF_GN_DES_TS_SIGHT_NB	Northbound Sight Lines
TRAF_GN_DES_TS_SIGHT_SB	Southbound Sight Lines
TRAF_GN_DES_TS_SIGHT_EB	Eastbound Sight Lines
TRAF_GN_DES_TS_SIGHT_WB	Westbound Sight Lines
TRAF_GN_DES_TS_WORK1	Working Level 1
TRAF_GN_DES_TS_WORK2	Working Level 2
TRAF_GN_DES_TS_WORK3	Working Level 3
TRAF_GN_DES_TS_WORK4	Working Level 4
TRAF_GN_DES_TS_WORK5	Working Level 5
TRAF_GN_DES_TS_POLE_PF_WING	Wings for Mast Arm Pole Foundation
TRAF_GN_DES_TS_POLE_OFFSET	10' Radius to assist with pole placement behind curb
TRAF_GN_DES_TS_STAGE	Staging Areas for Bore-Jack Operations
Lighting	
TRAF_EX_DES_LT_CON	Existing Conduit
TRAF_EX_DES_LT_JB	Existing Junction Box
TRAF_EX_DES_LT_MH	Existing Manhole
TRAF_PR_DES_LT_CON	Proposed Conduit
TRAF_PR_DES_LT_JB	Proposed Junction Box

Level	Description
TRAF_PR_DES_LT_MH	Proposed Manhole
TRAF_EX_DES_LT_CF	Existing Cabinet Foundations
TRAF_EX_DES_LT_PF	Existing Pole Foundations
TRAF_PR_DES_LT_CF	Proposed Cabinet Foundations
TRAF_PR_DES_LT_PF	Proposed Pole Foundations
TRAF_EX_DES_LT_CAB	Existing Cabinet and Controller
TRAF_EX_DES_LT_CC	Existing Control Center
TRAF_EX_DES_LT_SE	Existing Electrical Service
TRAF_EX_DES_LT_LA	Existing Luminaire Arm
TRAF_EX_DES_LT_LUM	Existing Luminaire
TRAF_EX_DES_LT_UB	Existing Underbridge Luminaires
TRAF_EX_DES_LT_MP	Existing Metal Pole
TRAF_EX_DES_LT_OP	Existing Other Pole
TRAF_EX_DES_LT_WP	Existing Wood Pole
TRAF_PR_DES_LT_CAB	Proposed Cabinet and Controller
TRAF_PR_DES_LT_CC	Proposed Control Center
TRAF_PR_DES_LT_SE	Proposed Electrical Service
TRAF_PR_DES_LT_LA	Proposed Luminaire Arm
TRAF_PR_DES_LT_LUM	Proposed Luminaire
TRAF_PR_DES_LT_UB	Proposed Underbridge Luminaires
TRAF_PR_DES_LT_MP	Proposed Metal Pole
TRAF_PR_DES_LT_OP	Proposed Other Pole

Level	Description
TRAF_PR_DES_LT_WP	Proposed Wood Pole
TRAF_EX_SHT_LT_LBL	Labels - Existing
TRAF_PR_SHT_LT_LBL	Labels - Proposed
TRAF_GN_SHT_LT_MISC	Sheet File - Miscellaneous
TRAF_GN_DES_LT_POLE_OFFSET	10' Radius to assist with pole placement behind curb
TRAF_GN_DES_LT_WORK1	Working Level 1
TRAF_GN_DES_LT_WORK2	Working Level 2
TRAF_GN_DES_LT_WORK3	Working Level 3
TRAF_GN_DES_LT_WORK4	Working Level 4
TRAF_GN_DES_LT_WORK5	Working Level 5
ITS-TMS	
TRAF_EX_DES_TM_CON	Existing Conduit
TRAF_EX_DES_TM_JB	Existing Junction Box
TRAF_EX_DES_TM_MH	Existing Manhole
TRAF_PR_DES_TM_CON	Proposed Conduit
TRAF_PR_DES_TM_JB	Proposed Junction Box
TRAF_PR_DES_TM_MH	Proposed Manhole
TRAF_EX_DES_TM_CF	Existing Cabinet Foundations
TRAF_EX_DES_TM_PF	Existing Pole Foundations
TRAF_PR_DES_TM_CF	Proposed Cabinet Foundations
TRAF_PR_DES_TM_PF	Proposed Pole Foundations

Level	Description
TRAF_EX_DES_TM_CAB	Existing Cabinet and Controller
TRAF_EX_DES_TM_SE	Existing Electrical Service
TRAF_EX_DES_TM_CAM	Existing CCTV Camera
TRAF_EX_DES_TM_DMS	Existing Dynamic Message Sign
TRAF_EX_DES_TM_HAR	Existing Highway Advisory Radio
TRAF_EX_DES_TM_RTMS	Existing Traffic Sensor
TRAF_EX_DES_TM_RWIS	Existing Weather Information Station
TRAF_EX_DES_TM_MP	Existing Metal Pole
TRAF_EX_DES_TM_OP	Existing Other Pole
TRAF_EX_DES_TM_WP	Existing Wood Pole
TRAF_PR_DES_TM_CAB	Proposed Cabinet and Controller
TRAF_PR_DES_TM_SE	Proposed Electrical Service
TRAF_PR_DES_TM_CAM	Proposed CCTV Camera
TRAF_PR_DES_TM_DMS	Proposed Dynamic Message Sign
TRAF_PR_DES_TM_HAR	Proposed Highway Advisory Radio
TRAF_PR_DES_TM_RTMS	Proposed Traffic Sensor
TRAF_PR_DES_TM_RWIS	Proposed Weather Information Station
TRAF_PR_DES_TM_MP	Proposed Metal Pole
TRAF_PR_DES_TM_OP	Proposed Other Pole
TRAF_PR_DES_TM_WP	Proposed Wood Pole
TRAF_EX_SHT_TM_AG LBL	Existing Above Ground Labels
TRAF_PR_SHT_TM_AG LBL	Proposed Above Ground Labels

Level	Description
TRAF_EX_SHT_TM_UG LBL	Existing Underground Labels
TRAF_PR_SHT_TM_UG LBL	Proposed Underground Labels
TRAF_GN_SHT_TM_MISC	Sheet File - Miscellaneous
TRAF_GN_DES_TM_WORK1	Working Level 1
TRAF_GN_DES_TM_WORK2	Working Level 2
TRAF_GN_DES_TM_WORK3	Working Level 3
TRAF_GN_DES_TM_WORK4	Working Level 4
TRAF_GN_DES_TM_WORK5	Working Level 5

Multi-Line Settings for Conduit			
Offset	Color	Style	Weight
0.8	34	3	3
0	34	0	3
-0.8	34	3	3

Note - Under the 'End Caps and Joints' tab the line column should be unchecked for 'Start Cap', 'End Cap' & 'Joints'

4.5 *TED Design Guidelines*

4.5.1 Text Font and Size

VDOT TCD plans use a combination of 'Engineering' (MicroStation Font 3) and 'Italics' (MicroStation Font 23) fonts. Text sizes are based on the drawing scale. Generally, the minimum text size for TCD plans is 1/8". The MicroStation text size for scales may be computed by dividing the drawing scale by 8.

For example:

A 25 Scale drawing should have a minimum text size of 3.125.

$$25/8 = 3.125$$

Title text on TCD plans should be approximately 3/16". Again, the MicroStation title text size for scales may be computed by multiplying the drawing scale by 3 and divide by 16.

A majority of text notes, legends, and call-outs are included in the TED cell libraries. The text size in the cell libraries is based on 25 scale plans. If a different scale is required then the cell should be scaled using the following formula:

$$\text{Plan Sheet Scale} / 25 = \text{Scale Factor}$$

4.5.2 Cell Libraries

The following instructions are used to demonstrate the purpose and uses of the cell library for the Traffic Section of the Location and Design Division.

4.5.2.1 Overview

The Traffic Engineering section of the Location and Design Division generally utilizes **TED** cell libraries for the completion of TCD plans using MicroStation.

The cell library provides Imperial cells only. The cell library also gives descriptive details about the cells such as the name of the cell, the cell description, and the cell library shows an image of the given cell.

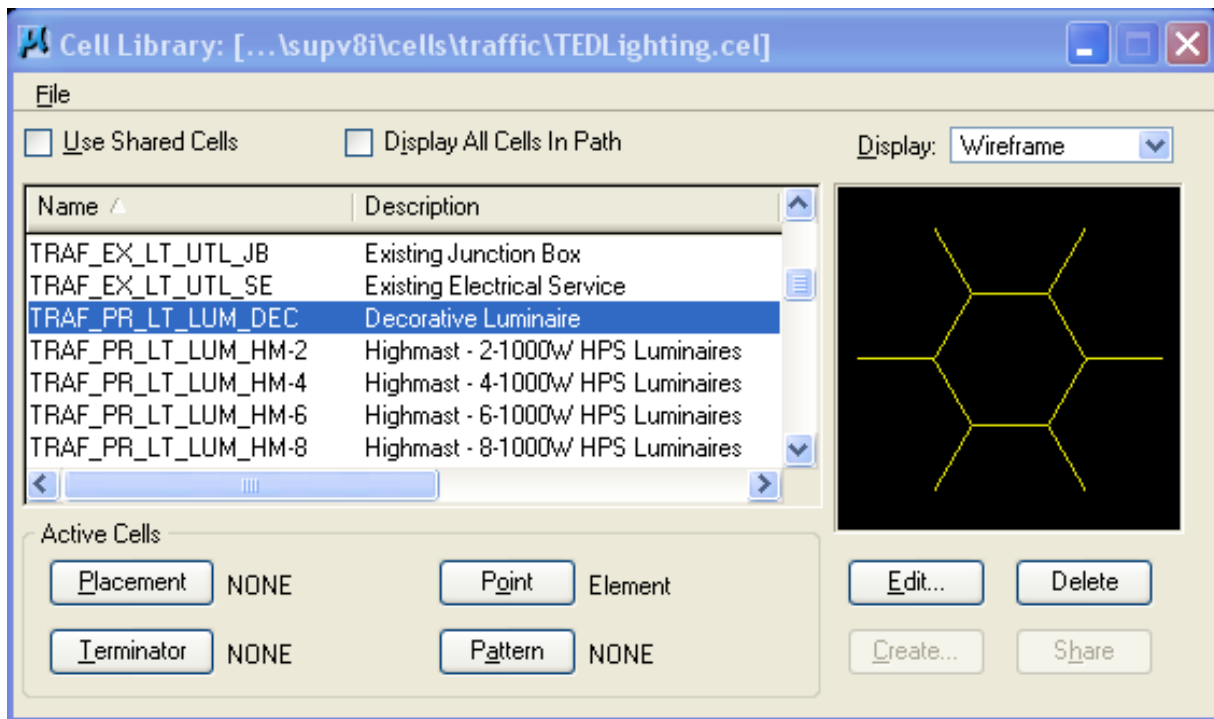
4.5.3 Traffic Cell Libraries

4.5.3.1 List of Cell Libraries

Cell Library	Description
TEDBorder	TE sign and seal blocks, title blocks and border labels.
TEDPaveLeg	Cells needed to build the Pavement Marking Legend.
TEDPaveMark	Pavement Markings including arrows, words, symbols and markers.
TEDPlanLabel	Labeling cells for plan sheets.
TEDSheet1	Cells for the Index of Sheets, Legends, and General Notes.
TEDLighting	Lighting equipment cells.
TEDSignal	Signal Equipment cells
TED Signing	Cells for sign posts, leaders, and sign schedule.
Panels-MUTCD	Cells for MUTCD standard sign panels.
Panels-MUTCD-WAPM	Cells for MUTCD standard sign panels that are listed in the WAPM.
Panels-Supplement	Cells for Virginia Supplement to the MUTCD standard sign panels.
Panels-Supplement-WAPM	Cells for Virginia Supplement to the MUTCD standard sign panels that are listed in the WAPM

Note: *The roadway design border cell and north arrow shall be used for all traffic plan sheets. See section 4.1.3 for further details*

This cell library window in MicroStation is show below.



4.5.3.2 MicroStation Access

To access the cell library through MicroStation:

- Select the MicroStation Icon
- Select **Element** at the top of the screen/task bar
- Select **Cells**
 - a cell library window will appear –
- Select File from the Cell library window (a list of cells will appear in a drop down menu)
- Click on the cell library from the drop down menu of your choice such as TEDSigning.cel, TEDSignal.cel, etc.
- Scroll through the cell library window until the user finds the appropriate cell.
- Double click the cell and place the cell in the design file.

4.5.3.3 Adjusting the size of the cell

Most of the design cells in the cell library are drawn to scale. If the cell appears to be too small or too large when placing it, refer to the following instructions on cell adjustment:

- When the user double clicks the cell, a ***Place Active Cell*** window appears.
- Data into the X Scale of the Place Active Cell window and type in the scale to decrease the cell or to increase the cell, then press the 'Enter' key. Pressing 'Enter' after typing in the X Scale will automatically change the Y Scale to the same number.
- This will now adjust the size of the cell. Place the cell into the design file by left clicking.
- *Sign Panel cells are designed to be placed using the scale of the plan sheet (ie. 25 or 50). Very large or small signs, and custom signs will still need to be adjusted.*

4.5.3.4 Signal Pole & Controller Cabinet Legend Cells

A number of cells are available in the TEDPlanLabel.cel cell library that can be utilized to develop signal pole and controller cabinet legends. The signal pole legend cells have been designed to give the user the flexibility to build multiple signal pole or controller cabinet legends. All cells, except those for the electrical service and the wireless antenna, utilize 'tags' that allow for easy data entry for the variable attributes included in each line of the legend. See section 4.5.2.5.3 for tag editing procedures.

Modifications to the electrical service cell should be made using the "Edit Text" command. Typically, there should be no modifications needed for the wireless antenna cell.

4.5.2.5.1 Creating Legends

To create a signal pole or controller cabinet legend, place the cell containing the first line of the legend:

- LGD POLE_LBL for mast arms and strain poles;
- LGD PED_LBL for pedestal poles; or
- LGD CONT for controller cabinets





Next, edit the variable text in that cell using the 'Edit Tags' command (see section 4.5.2.5.2). Then, place cells containing the remaining lines until a complete legend is created for the pole. The 'LGD POLE_LBL' and 'LGD PED_LBL' cells contain snap points (located on MicroStation level 62) for snapping subsequent lines of the legend obtained from other cells. The snap points are provided for uniform text alignment. (Note that there are no subsequent lines of legend to be added for controller cabinet legends)

The available signal pole legend cells are shown in the table on the following page. The higher ranked cells should be placed over lower ranked cells.

4.5.2.5.2 Referencing Baselines in Signal Pole Legends

There are two cell options available for those lines of signal pole legend text that include reference to a construction baseline (i.e. pole locations and arm orientation). If reference is made to baselines associated with a route number (such as Rte. 659) use legend cells ending in '-RTE'. If there is no route number associated with the referenced baseline (typically this occurs only in cities or towns on non-VDOT maintained roadways) use the legend cells ending in '-RDWY'. These cells allow the user to reference the baseline associated with a roadway name, such as East Broad Street


The cells are shown in the table below:

Cell Name	Cell Text
LGD ARM-RTE	<i>XX' Arm XXX° Angle to Rte.XXXX Constr. </i>
LGD ARM-RDWY	<i>XX' Arm XXX° Angle to Roadway Name</i>
LGD LUM-RTE	<i>XX' Luminaire Arm XXX° Angle to Rte. XXXX Constr. </i>
LGD LUM-RDWY	<i>XX' Luminaire Arm XXX° Angle to Roadway Name</i>
LGD POLE_LOC-RTE	<i>XX.X' RT. of Rte.XXXX Constr.  Sta.XXX·XX</i>
LGD POLE_LOC-RDWY	<i>XX.X' RT. of Roadway Name</i>
LGD CON_BL	<i>Constr.  Sta.XXX·XX</i>

The '-RDWY' legend cells need to be supplemented with a second legend cell, 'LGD CON_BL'. This cell contains the text "Constr. BL Sta. XXX+XX". This cell is added separately from the '-RDWY' cell because the length of the roadway name text is always variable. After placing the appropriate '-RDWY' cell, the user shall edit the variable text for the roadway name contained in the '-RDWY' cell. Once the roadway name has been edited in the '-RDWY' cell, the 'LGD CON_BL' cell should be added by snapping to the end of the roadway name. The text "Sta. XXX+XX" is located in a tag for editing.

Note that the legend lines for arm and luminaire angles do not require reference to a station. The text "Sta. XXX+XX" can be turned off by un-checking the display column in the modify tags dialog box.

Signal Pole Legend Cells

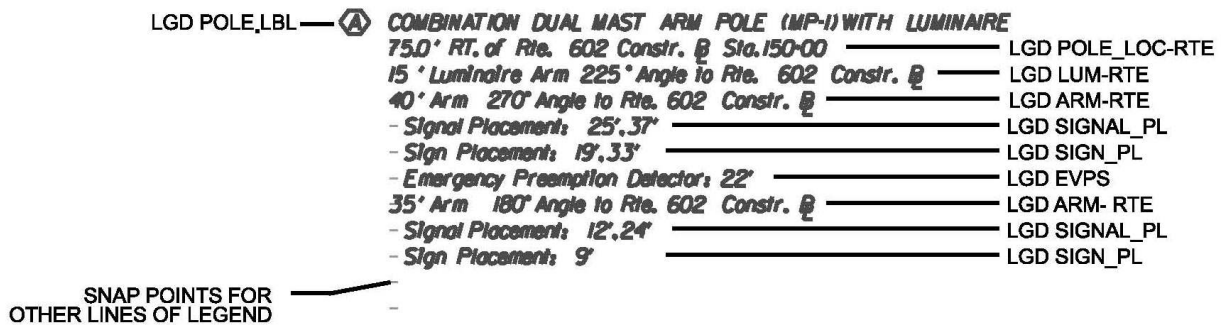
	Ranking	Cell Name	Description
Higher  Lower	1	LGD POLE_LBL or LGD PED_LBL	Label for mast arms and strain poles Label for pedestal poles
	2	LGD POLE_LOC-RTE or LGD POLE_LOC-RDWY & LGD CON_BL	Pole location information (Reference to Rte. No. Baseline) Pole location information (Reference to Roadway Name Baseline)
	3.1	LGD LUM-RTE or LGD LUM-RDWY & LGD CON_BL	Luminaire Arm Information – 1 st Arm (Reference to Rte. No. Baseline) Luminaire Arm Information – 1 st Arm (Reference to Roadway Name Baseline) (Note: Uncheck the Display column in the LGD CON_BL cell)
	3.2	LGD LUM-RTE or LGD LUM-RDWY & LGD CON_BL	Luminaire Arm Information – 2 nd Arm, if necessary (Reference to Rte. No. Baseline) Luminaire Arm Information – 2 nd Arm, if necessary (Reference to Roadway Name Baseline) (Note: Uncheck the Display column in the LGD CON_BL cell)
	4	LGD ARM-RTE or LGD ARM-RDWY & LGD CON_BL	Mast Arm Information – 1 st Arm (Reference to Rte. No. Baseline) Mast Arm Information – 1 st Arm (Reference to Roadway Name Baseline) (Note: Uncheck the Display column in the LGD CON_BL cell)
	4.1	LGD SIGNAL_PL	Signal head placement along Arm 1
	4.2	LGD SIGN_PL	Sign placement along Arm 1
	4.3	LGD VIDEO	Video detection camera placement along Arm 1
	4.4	LGD EVPS	Emergency vehicle preemption detector placement along Arm 1
	5	LGD ARM-RTE or LGD ARM-RDWY & LGD CO_BL	Mast Arm Information – 2 nd Arm, if necessary (Reference to Rte. No. Baseline) Mast Arm Information – 2 nd Arm, if necessary (Reference to Roadway Name Baseline) (Note: Uncheck the Display column in the LGD CON_BL cell)
	5.1	LGD SIGNAL_PL	Signal head placement along Arm 2
	5.2	LGD SIGN_PL	Sign placement along Arm 2
	5.3	LGD VIDEO	Video detection camera placement along Arm 2
	5.4	LGD EVPS	Emergency vehicle preemption detector placement along Arm 2
	6	LGD ELEC SER	Electrical service information
	7	LGD ANT	Wireless antenna information

Example 1:

Combination Mast Arm Pole (MP-1) with two mast arms and a luminaire (Location referenced to Rte. 602 baseline)

Arm 1: Signals, Signs, and Emergency Preemption Detector (No VideoDetection)

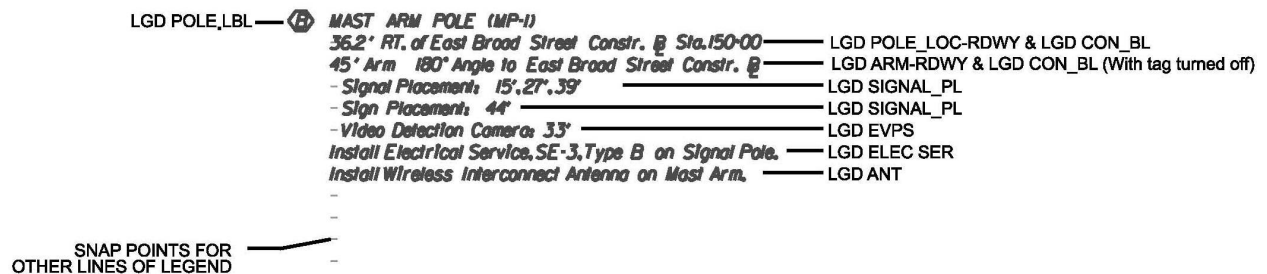
Arm 2: Signals and Signs (No Video or Emergency Preemption Detectors)



Example 2:

Mast Arm Pole (MP-1) with one mast arm, electrical service (SE-3, Type A), and wireless antenna located on pole (Location referenced to East Broad Street baseline)

Arm: Signals, Signs, and Video Detector



4.5.2.5.3 Editing Tags

Once the signal pole legend cells have been placed, the variable text included in each cell should be modified. The variable text is contained in tags. To edit the tags:

1. Choose 'Edit Tags' from the 'Tag' toolbox.
2. Using the 'Edit Tags' command, click on the cell.
3. The 'Edit Tags' dialog window will open.



4. The box will list all variable text included in the cell. Edit any variable text in the 'Value' column. Holding the cursor over any text in the 'Value' column displays a prompt that describes the information that should be input in each line.
5. Click OK and the cell is automatically updated to incorporate the text input in step 4. All text is incorporated into the cell at the correct justifications. Depending on the entered text there may be extra spaces between some text elements. This is acceptable. Do not 'Drop Status' on the cell because the functionality of the tag will be lost.

The table on the following page displays the signal pole legend cells included in the TEDPlanLabel.cel cell library and the variable text included in each cell.

Signal Pole Legend Cells – Variables		
Cell Name	Variable Text	Variable Text Prompts
LGD POLE_LBL	01: POLE LABEL	Enter pole label: A, B, C, etc.
	02: POLE TYPE	Enter pole type: <ul style="list-style-type: none"> • MAST ARM POLE (MP-1) • COMBINATION MAST ARM POLE (MP-1) WITH LUMINAIRE • COMBINATION MAST ARM POLE (MP-1) WITH LUMINAIRES • COMBINATION DUAL MAST ARM POLE (MP-1) WITH LUMINAIRE • COMBINATION DUAL MAST ARM POLE (MP-1) WITH LUMINAIRES • STRAIN POLE (MP-2) • COMBINATION STRAIN POLE (MP-2) WITH LUMINAIRE • COMBINATION STRAIN POLE (MP-2) WITH LUMINAIRES • WOOD SIGNAL POLE (WD-2)
LGD PED_LBL	01: PEDESTAL POLE LABEL	Enter pole label: A, B, C, etc.
	02: PEDESTAL TYPE	Enter pedestal pole type: PF-2 or PF-3
	03: PEDESTAL HEIGHT	Enter pedestal pole height
LGD POLE_LOC-RTE	01: POLE OFFSET	Enter offset direction from the center of pole to the baseline – Round to the nearest tenth of a foot (ex. 73.5, 12.0, etc.)
	02: OFFSET DIRECTION	Enter offset direction from the baseline: RT or LT
	03: ROUTE (POLE)	Enter the route number associated with the baseline
	04: STATION	Enter the station that corresponds to the center of the pole

Signal Pole Legend Cells – Variables (cont.)

Cell Name	Variable Text	Variable Text Prompts
LGD POLE_LOC-RDWY	01: POLE OFFSET	Enter offset direction from the center of pole to the baseline – Round to the nearest tenth of a foot (ex. 73.5, 12.0, etc.)
	02: OFFSET DIRECTION	Enter offset direction from the baseline: RT or LT
	03: RDWY (POLE)	Enter the roadway name associated with the baseline
	04: STATION	Enter the station that corresponds to the center of the pole
LGD LUM-RTE	01: LUM ARM LENGTH	Enter the luminaire arm length
	02: ANGLE (LUM)	Enter the luminaire orientation angle to the baseline
	03: ROUTE (LUM)	Enter the route number associated with the baseline
LGD LUM-RDWY	01: LUM ARM LENGTH	Enter the luminaire arm length
	02: ANGLE (LUM)	Enter the luminaire orientation angle to the baseline
	03: RDWY (LUM)	Enter the roadway name associated with the baseline
LGD ARM-RTE	01: ARM LENGTH	Enter the mast arm length
	02: ARM ANGLE	Enter the mast arm orientation angle to the baseline
	03: ROUTE (ARM)	Enter the route number associated with the baseline
LGD ARM-RDWY	01: ARM LENGTH	Enter the mast arm length
	02: ARM ANGLE	Enter the mast arm orientation angle to the baseline
	03: RDWY (ARM)	Enter the roadway name associated with the baseline
LGD SIGNAL_PL	01: SIGNAL PLACEMENT	Enter the distance from the center of the pole to each signal head – Round to the nearest foot. Note: All distances should be separated with a comma and a space.
LGD SIGN_PL	01: SIGN PLACEMENT	Enter the distance from the center of the pole to each sign – Round to the nearest foot. Note: All distances should be separated with a comma and a space.

Signal Pole Legend Cells – Variables (cont.)

Cell Name	Variable Text	Variable Text Prompts
LGD VIDEO	01: VIDEO DETECTOR	Enter the distance from the center of the pole to each video detection camera – Round to the nearest foot. Note: If there are multiple cameras, all distances should be separated with a comma and a space.
LGD EVPS	01: EVPS DETECTOR	Enter the distance from the center of the pole to each emergency preemption detector – Round to the nearest foot. Note: If there are multiple detectors, all distances should be separated with a comma and a space.

Controller Cabinet Legend Cell – Variables

Cell Name	Variable Text	Variable Text Prompts
LGD CONT	01: CONTROLLER LABEL	Enter controller label (A, B, C, etc.)
	02: CONTROLLER FD'N TYPE	Enter controller foundation type
	03: DOOR HINGER	Enter side of controller for door hinge.

4.6 Plotting with MicroStation V8i

For detailed information on plotting please click on this link [Chapter 3, Section 3.11](#)

For all TCD plans, users shall plot using the following pen tables:

For Full-size plots –ld_v95 traffic.tbl

For Half-size plots – half_v95 traffic.tbl