# 11 QUANTITIES AND REPORTS

## OBJECTIVE

In this chapter the CADD Quantity Workflow will be covered.  Topics include:

- Generate Quantities and Export to Quantity Manager

- Quantity Manager Overview

- Create Tabulation of Quantities Sheet using Linked Data Manager (LDM)

## INTRODUCTION

This chapter covers applications used to generate and document quantities in the plans.  This workflow includes calculating the quantities using the D&C Manager, exporting the quantities to Quantity Manager, and using Linked Data Manager (LDM) to create the Tabulation of Quantities sheet using the Quantity Manager database.

The workflow to export quantities from Quantity Manager to Designer Interface for AASHTOWare Project Preconstruction and create the Summary of Pay Items sheet is documented in the FDOT Automated Quantities training manual.

## GENERATE QUANTITIES

Quantities can be generated from the elements drawn in MicroStation using D&C Manager or tagged with the GEOPAK attribute. The GEOPAK Draw Cell by Feature tools and the Open Roads Civil Tools use the D&C Manager database in the background to set and tag the elements being drawn. Quantities may also be generated manually or using other software.

Traffic Plans components use **Tabulation of Quantities** sheets to document quantities.  D&C Manager has the ability to generate individual sheet quantities using the clip borders created using the Plan/Profile Sheet Composition tool.

> *Note*     *In order to use this method, the clip borders must be in the active file.  It is recommended to calculate the quantities in the CLIPXX file with the DSGNXX file referenced.*

### D&C MANAGER COMPUTE MODE

The Compute mode tabulates quantities of items placed as Pay Items by the D&C Manager.  When the *Compute* option is selected, D&C Manager expands to add a list box at the bottom of the dialog. This is the *Collection* bin.  Using this bin is optional. Quantities may also be calculated with a single item or category selected.  To load items into the collection bin double click on the item or right click and select *Add to Collection*.  Categories can be added by right clicking and selecting *Add to Collection*.  To clear the collection bin, right click in the collection bin area and select *Clear Collection*. Once all of the items are added to the collection bin, the list can be saved for

future use. To save a collection right click in the collection bin area and select *Save Collection*. Save the file to the project discipline directory.
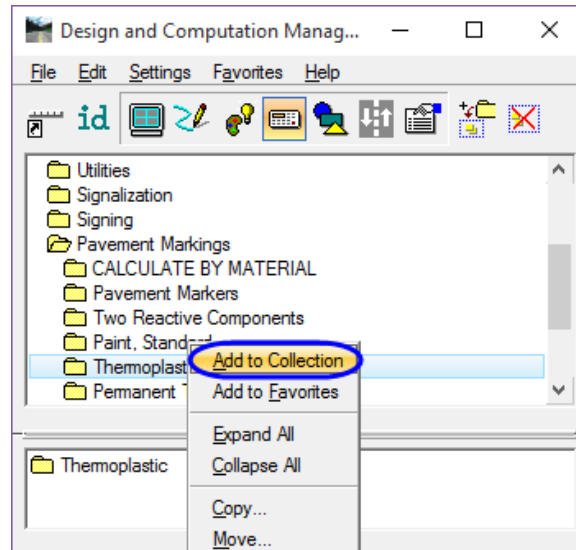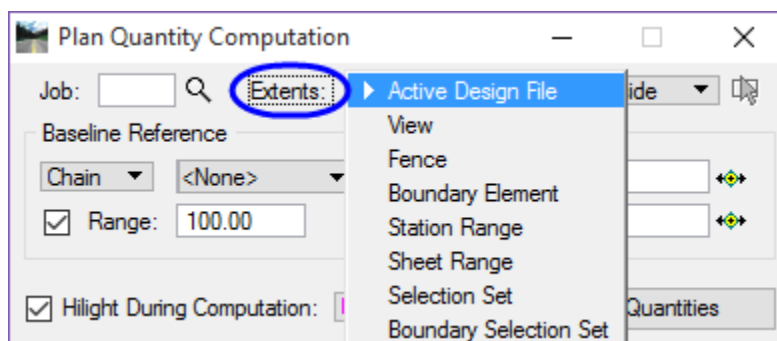


## COMPUTING QUANTITIES

Plan Quantity Computation opens when the **Compute** is selected.
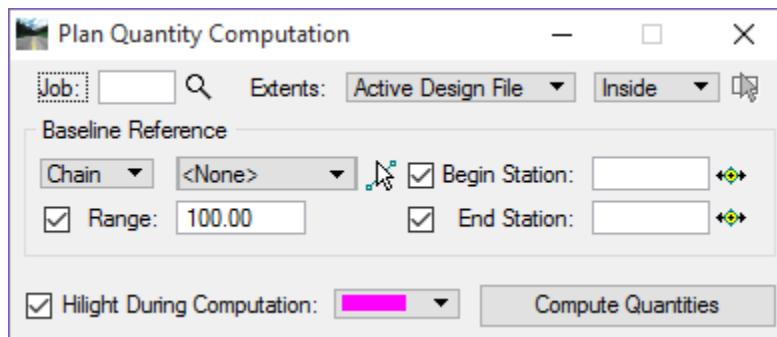


- **Job**          COGO database for the project used for chain information (GEOPAK *gpk* file)
- **Extents**      List of options for limiting the area and elements included in the quantity calculations.



- o   *Active Design File* – All elements in the Active Design File are candidates for computation.

- o   *View* – Only the selected items that are displayed in MicroStation view one are computed.

o  *Fence* – A MicroStation fence must be placed, and all specified graphical features, which satisfy both the fence and the Range, will be tabulated.

o  *Boundary Element* – A previously drawn closed shape is used to determine quantities. When selected, you are prompted to select the closed shape. This mode is sensitive to the MicroStation Inside, Overlap and Clip modes.

o  *Station Range* – A Baseline Reference (chain or dgn) must be defined for this option. The range fields default to the extent of the chain. Key-in a station or by clicking Begin or End Station icons, graphically define the station range. Perpendicular projections to the station(s) define the extent of the computations. This option is not ideal for sheet quantities.

o  *Sheet Range* – Sheets (clip borders) placed with the Plan/Profile Sheet Composition tool are used to define the area of computation.

o  *Selection Set* – A MicroStation selection set is defined to set the elements to be computed.

o  *Boundary Selection Set* – A MicroStation selection set of the Boundary (not the actual candidate compute elements) must be created prior to computing.

- **Baseline Reference** allows the designer to define a *Chain* or *DGN Element* for offsets and station values for reports. In addition the *Range*, if set, is measured from the selected *Chain* or *DGN Element* to search for candidate items. Setting the *Baseline Reference* to **None** limits the type of output that can be generated as no station / offset values can be computed.
- **Highlight During Computation,** when selected, all MicroStation elements computed are highlighted in the selected highlight color.
- **Compute Quantities** starts the computation process and when completed opens the Computation Results dialog.



> *Note*     *It is imperative that you review these results before going any further. If there are any errors or omissions now is the time to fix or add them.*

o  *Export Format* sets the type of output the designer wants to generate from the reported quantities. There are several formats:

▪ Comp Book – A more detailed report that lists not only quantity summaries, but also geometric properties such as plan view coordinates and station/offsets for located elements. File is in ASCII format.

▪ Item Report – Quantities Summary listing pay items, descriptions, units and total quantities for located elements. File is in ASCII format.

- Item Table – Contains the same information as the Item Report, but formatted in tabular form.

- DBMS – Very detailed information including calculated and rounded quantities, geometric properties, pay item numbers, descriptions, station / offset values, etc. The format is the selected database (i.e., Microsoft Access, Oracle, SQL Server) defined in the Compute Settings. This option is required when taking the quantities into Quantity Manager.

- CSV By Item –Summary listing pay items, descriptions, units and total quantities for located elements. Format is CSV (coma separated values).

- CSV By Element – A more detailed report that lists not only quantity summaries, but also geometric properties such as plan view coordinates and station/offsets for located elements. Format is CSV (coma separated values).

- Table – User defined table column properties. A column for designating the appropriate symbol is also included, as well as Adhoc attribute data. This option is used to generate legends such as for landscape plans.

o *File Name* field next to the Export Format is the output file. Using the hourglass allows the designer to browse to a specific folder.

o *Create or Append* are the two export options for the quantities. This will place the quantities into a new file or append them to a previously created file.

o *Run and Groupings* are only used for the DBMS export format to Quantity Manager.

- Run is a user key-in and any logical description, like Pavement Marking or Preliminary, can be used. This description will be passed to Quantity Manager.

- Groupings  Value to define the TRNSPORT Grouping in Quantity Manager.

o *Export* commences the output file process and creates the quantity file. In this training, you will be exporting to DBMS, which will create an MDB file that can then be opened with Quantity Manager.

## Exercise 11.1        *Generate Quantities and Export to Quantity Manager*

➤ **Create a Collection (Part 1)**

In this part of the exercise the student will create a collection of items used to generate.

1.   If closed, open *CLIPSP01.dgn* in the *Signing* folder.

2.   Open D&C Manager and click the **Compute** icon. (This is the *Calculator* icon).

> *Note*      *If there are items in the collection bin of* **D&C Manager**, *right click in the collection area and select Clear Collection.*

3.   Next, select the *Thermoplastic category,* right click and select **Add to Collection**.

4.   Double click on the item **Pavement Markings > Paint, Standard > Island Nose > 0710 11290 Paint, Std., Yellow, Island Nose** to add the item to the collection.

5.   Double click on the item **Pavement Markings > Pavement Markers > 0706  3 Retro-Reflective Pavement Marker** to add the item to the collection.
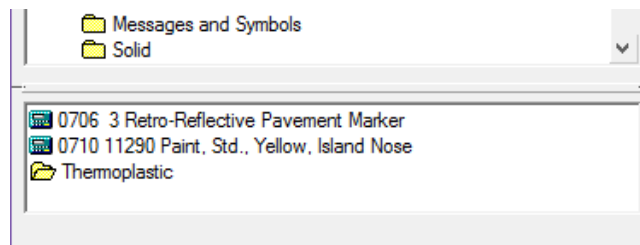


➤ **Use the Display Tool to Review the Quantity Items (Part 2)**

1.   Click the **Display** tool on D&C Manager.
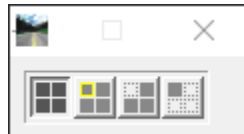


2.   On the *Display* tool, click the **Highlight** icon. (This will highlight all of the items in the collection.)

3.   Take a moment to review the design file.

> *Hint*     It may be helpful to turn off all of the reference files except for the DSGNSP01.dgn in order to more clearly identify any elements not being highlighted.
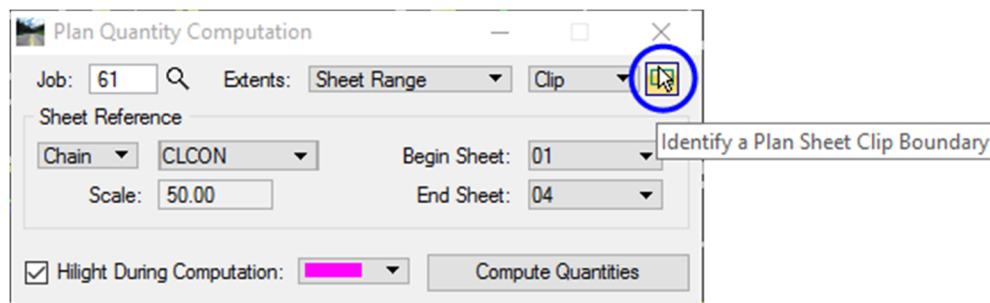
4.   Set the *Display Option* to **Normal**.

5.   Close the **Display** tool.

➢ *Compute quantities (Part 3)*

1. On D&C Manager dialog, click the **Compute** icon. (This opens Plan Quantity Computation.)
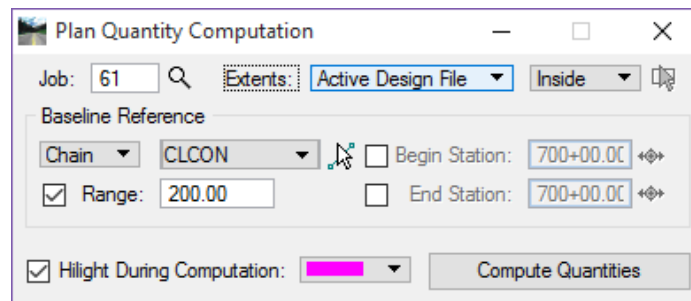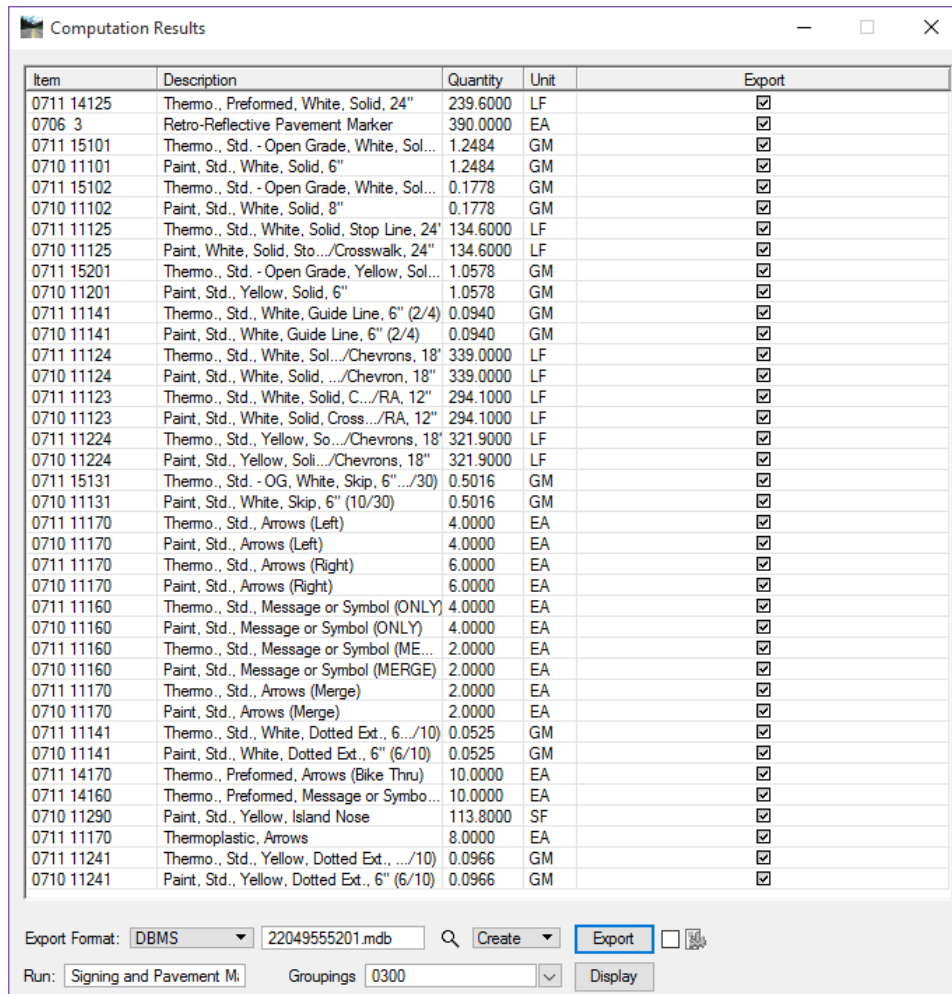


2. The *Job* number is **61.**

3. Set the *Extents* to **Sheet Range**.

4. Set to *Method* to **Clip**.

5. Toggle **On** Highlight During Computation.

6. Click **Identify a Plan Sheet Clip Boundary** button next to the *Extents* drop down menu.



7. Select the first sheet **Clip Border** on the *SR61 alignment*.

8. For the *End Sheet*, select **Sheet 04/Sequence 4** from the drop down list.

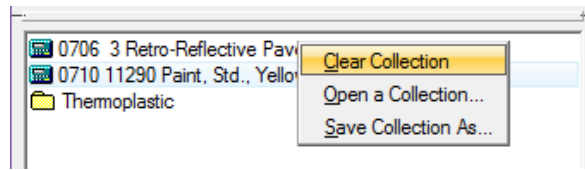9. Click **Compute Quantities**. This opens Computation Results dialog.

> ➢ **Export Quantities to DBMS for Quantity Manager (Part 4)**



| Item | Description | Quantity | Unit | Export |
|------|-------------|----------|------|--------|
| 0711 14125 | Thermo., Preformed, White, Solid, 24" | 239.6000 | LF | ☑ |
| 0706 3 | Retro-Reflective Pavement Marker | 390.0006 | EA | ☑ |
| 0711 15101 | Thermo., Std. - Open Grade, White, Sol... | 1.2484 | GM | ☑ |
| 0710 11101 | Paint, Std., White, Solid, 6" | 1.2484 | GM | ☑ |
| 0711 15102 | Thermo., Std. - Open Grade, White, Sol... | 0.1778 | GM | ☑ |
| 0710 11102 | Paint, Std., White, Solid, 8" | 0.1778 | GM | ☑ |
| 0711 11125 | Thermo., Std., White, Solid, Stop Line, 24' | 134.6000 | LF | ☑ |
| 0710 11125 | Paint, White, Solid, Sto.../Crosswalk, 24" | 134.6000 | LF | ☑ |
| 0711 15201 | Thermo., Std. - Open Grade, Yellow, Sol... | 1.0578 | GM | ☑ |
| 0710 11201 | Paint, Std., Yellow, Solid, 6" | 1.0578 | GM | ☑ |
| 0711 11141 | Thermo., Std., White, Guide Line, 6" (2/4) | 0.0940 | GM | ☑ |
| 0710 11141 | Paint, Std., White, Guide Line, 6" (2/4) | 0.0940 | GM | ☑ |
| 0711 11124 | Thermo., Std., White, Sol.../Chevrons, 18' | 339.0000 | LF | ☑ |
| 0710 11124 | Paint, Std., White, Solid, .../Chevron, 18" | 339.0000 | LF | ☑ |
| 0711 11123 | Thermo., Std., White, Solid, C.../RA, 12" | 294.1000 | LF | ☑ |
| 0710 11123 | Paint, Std., White, Solid, Cross.../RA, 12" | 294.1000 | LF | ☑ |
| 0711 11224 | Thermo., Std., Yellow, So.../Chevrons, 18' | 321.9000 | LF | ☑ |
| 0710 11224 | Paint, Std., Yellow, Soli.../Chevrons, 18" | 321.9000 | LF | ☑ |
| 0711 15131 | Thermo., Std. - OG, White, Skip, 6".../30) | 0.5016 | GM | ☑ |
| 0710 11131 | Paint, Std., White, Skip, 6" (10/30) | 0.5016 | GM | ☑ |
| 0711 11170 | Thermo., Std., Arrows (Left) | 4.0000 | EA | ☑ |
| 0710 11170 | Paint, Std., Arrows (Left) | 4.0000 | EA | ☑ |
| 0711 11170 | Thermo., Std., Arrows (Right) | 6.0000 | EA | ☑ |
| 0710 11170 | Paint, Std., Arrows (Right) | 6.0000 | EA | ☑ |
| 0711 11160 | Thermo., Std., Message or Symbol (ONLY) | 4.0000 | EA | ☑ |
| 0710 11160 | Paint, Std., Message or Symbol (ONLY) | 4.0000 | EA | ☑ |
| 0711 11160 | Thermo., Std., Message or Symbol (ME... | 2.0000 | EA | ☑ |
| 0710 11160 | Paint, Std., Message or Symbol (MERGE) | 2.0000 | EA | ☑ |
| 0711 11170 | Thermo., Std., Arrows (Merge) | 2.0000 | EA | ☑ |
| 0710 11170 | Paint, Std., Arrows (Merge) | 2.0000 | EA | ☑ |
| 0711 11141 | Thermo., Std., White, Dotted Ext., 6.../10) | 0.0525 | GM | ☑ |
| 0710 11141 | Paint, Std., White, Dotted Ext., 6" (6/10) | 0.0525 | GM | ☑ |
| 0711 14170 | Thermo., Preformed, Arrows (Bike Thru) | 10.0000 | EA | ☑ |
| 0711 14160 | Thermo., Preformed, Message or Symbo... | 10.0000 | EA | ☑ |
| 0710 11290 | Paint, Std., Yellow, Island Nose | 113.8000 | SF | ☑ |
| 0711 11170 | Thermoplastic, Arrows | 8.0000 | EA | ☑ |
| 0711 11241 | Thermo., Std., Yellow, Dotted Ext., .../10) | 0.0966 | GM | ☑ |
| 0710 11241 | Paint, Std., Yellow, Dotted Ext., 6" (6/10) | 0.0966 | GM | ☑ |

Export Format: DBMS ▼  22049555201.mdb  🔍 Create ▼  Export  ☐ 📊

Run: Signing and Pavement M⋮    Groupings: 0300 ▽    Display

10. Set the *Export Format* to **DBMS**. (This is the required format for Quantity Manager.)

11. Enter the file name **22049555201** (It's recommend to use the fin number. The MDB file extension will be added automatically.)

12. Set to **Create**. (The options are *Create* or *Append*.)

13. For *Run*, enter Signing and Pavement Markings. (Optional)

14. For *Groupings,* type in **0300**.

15. Click **Export**. (This creates the MDB file.)

16. Close Computation Results dialog.

> ➢ *Add Signing Quantities to Quantity Manager (Part 5)*

17. On the D&C Manager dialog, right click inside the Collection bin and select Clear Collection.



18. Select the Signing category.

19. On the Plan Quantity Computation dialog click Compute Quantities.

20. On the Computation Results dialog, change the Create option to Append.

21. Click Export.

# QUANTITY MANAGER

Quantity Manager is the GEOPAK tool used to store, organize, and manipulate quantities generated by the D&C Manager. Pay items and quantities can also be stored in the database manually. Once the information is loaded into Quantity Manager, the designer can then export the data from Quantity Manager in a format that can be imported into Designer Interface. Linked Data Manager uses the Quantity Manager database to automate the creation of the Tabulation of Quantities Sheets. It is not the intent of this chapter is to provide full training on all of the functions within Quantity Manager. For more in depth information, see the Bentley Help files.

Quantity Manager can be loaded from the Road toolbox, from the MicroStation menu, select **GEOPAK > ROAD > Quantity Manager**, or from the *FDOT Plans Development > Quantities* Task menu, select the **Quantity Manager** icon.

# QUANTITY MANAGER DIALOG

Quantity Manager has three parts, as shown in the following figure: *Menu bar, Tool Bar* and *Window Area*. The Window area has three panes*: Pay Item, Quantity,* and *Element*.
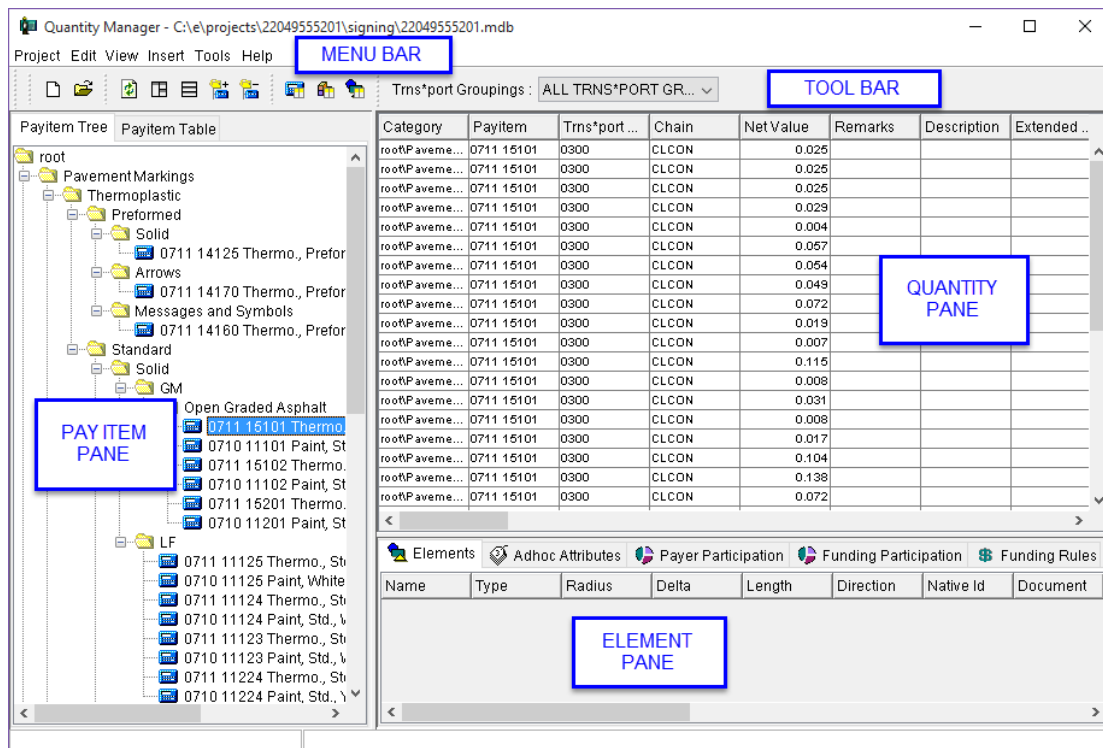


## PAY ITEM PANE

> *The Pay Item Pane is located on the left side of **Quantity Manager** in Normal View and is the top pane when tiled horizontally. Two tabs control the display type for the Pay Item pane:*

- o *Payitem Tree* – This tab displays the contents in a hierarchical structure easily navigated in the same manner as D&C Manager.

- o *Payitem Table* – This tab displays the database Pay Items in a table format that contains additional information about Pay Items and is useful for selecting multiple items.

## QUANTITY PANE

*The Quantity Pane displays only quantity information under the current Phase selected on the tool bar about the specifically selected Pay Item or Category. The information is customizable by selecting which columns to display and sorts by clicking on any of the column headers.*

## ELEMENT PANE

*The Element Pane displays information specific to the selected Quantity. Each tab displays different attributes. The Elements tab shows all the elements that make up that Quantity. Adhoc Attributes tab displays any Adhoc related to the Quantity. Funding Participation, Funding Rules, and Payer Participation tab displays information related to funding sources.*

## Exercise 11.2        *Navigating Quantity Manager*

In this exercise, Quantity Manager will be opened using the previously created database to review the items.

> ### ➤ *Opening a Project*

1.  From the MicroStation Menu, select **Applications** > **GEOPAK Road** > **Quantity Manager**.

2.  From the Quantity Manager Menu, select **Project** > **Open**. Connect to Database dialog displays.
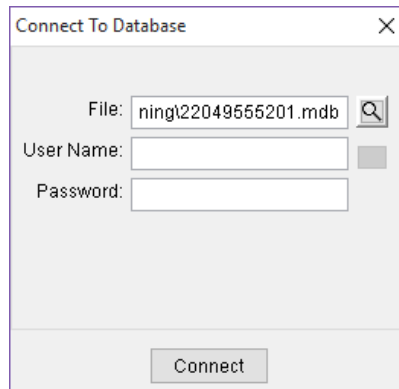


3.  In the *File* box, enter the path to the database, 22049555201.mdb

    <OR> click the **Select Database Filename** icon and navigate to the file.

4.  Leave the *User Name* and *Password* boxes **blank**.

5.  Click the **Connect** button. The database displays.

6.  From Quantity Manager, select the **Pay Item Tree** tab.

7.  Navigate through the database and select *Pay Item* **0711 15101**.
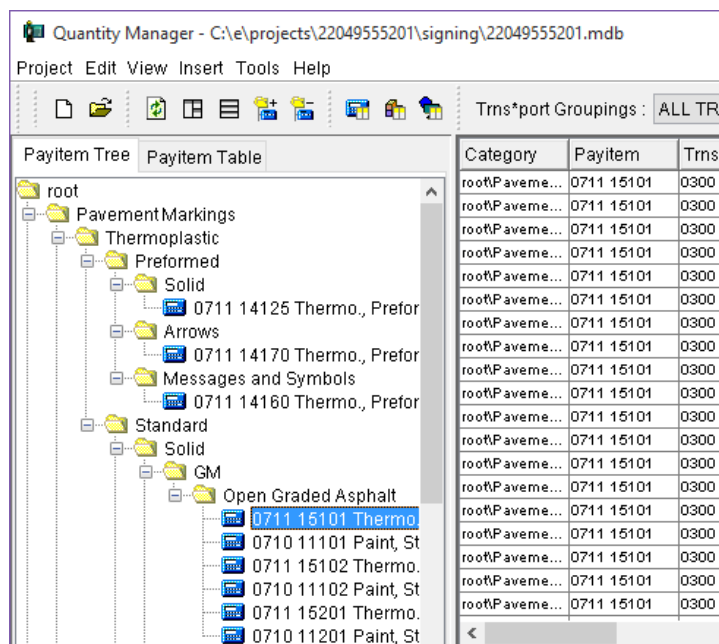
8.  In the *Quantity Pane*, select one of the quantity rows.

9.  In the *Elements Pane*, select the **Elements** tab and review the components of the selected quantity.
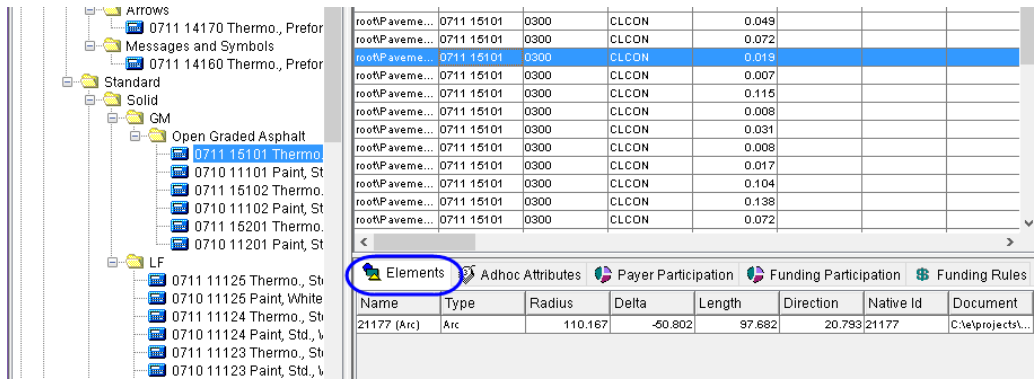


10. In the *Element Pane*, select the **Adhoc Attributes** tab. The Adhoc tags display for this element.
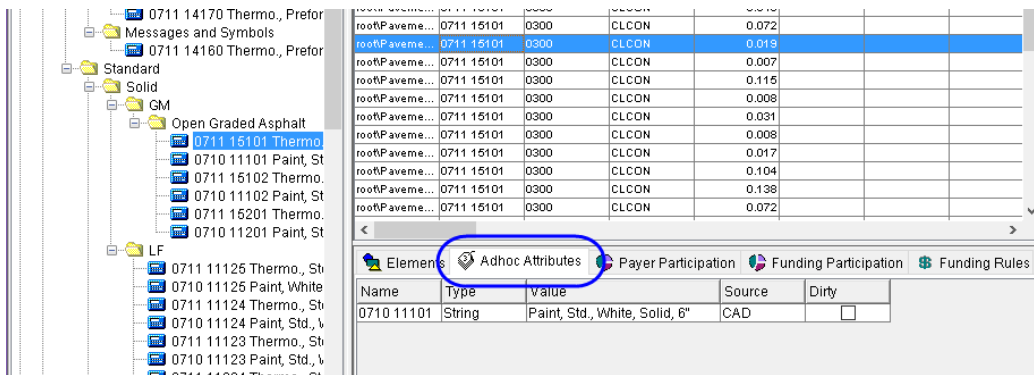


11. Close Quantity Manager.

# LINKED DATA MANAGER BASICS

Access LDM through the FDOT Menu to create a link between Excel spreadsheet files and the MicroStation design (DGN) file for easy placement and updating of Summary Boxes.  The LDM link provides easy access to the Excel spreadsheet for modification and update with a simple right-click on the link.

Access LDM from the FDOT Menu by selecting **Actions > Linked Data Manager**.

<OR>

From the *FDOT Plans Development > Quantities* Tasks menu, select the **Linked Data Manager** icon.

<OR>

Select Linked Data Manager from the Right Click Context Menu. (if available)
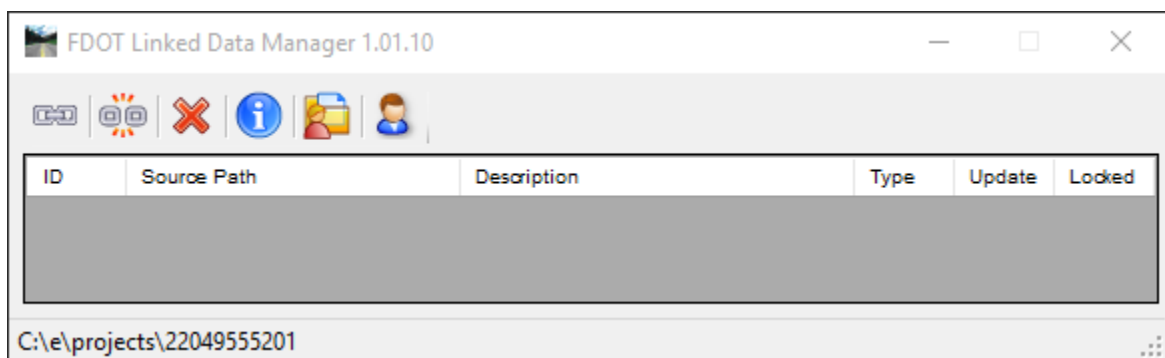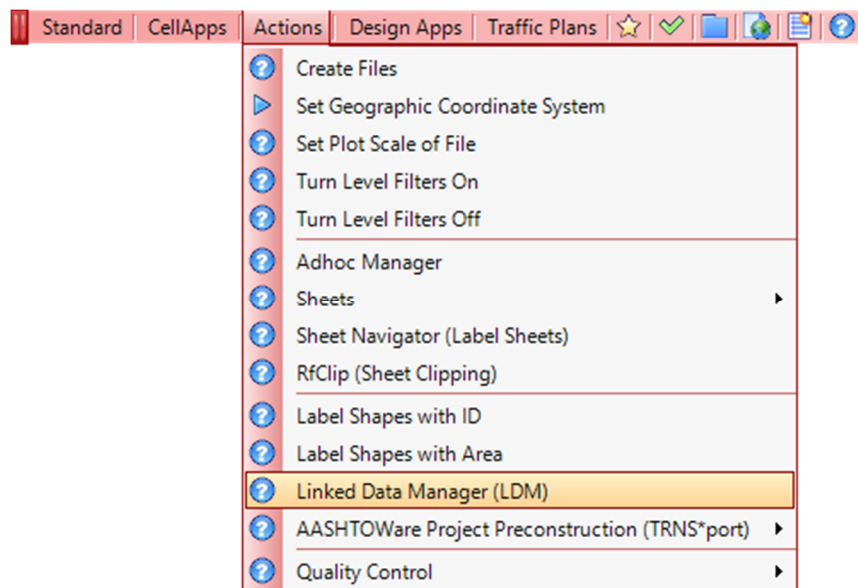




> ***Note***      *For more in-depth information on the features of this tool, refer to the **LDM** Help file or Posted Webinars.*

LDM provides an automated option (*Create New from Quantities*) to create FDOT Summary Boxes and Tabulation of Quantities sheets that only need to be run once to generate an Excel template file from Quantity Manager with all worksheets created and contained in a single file.
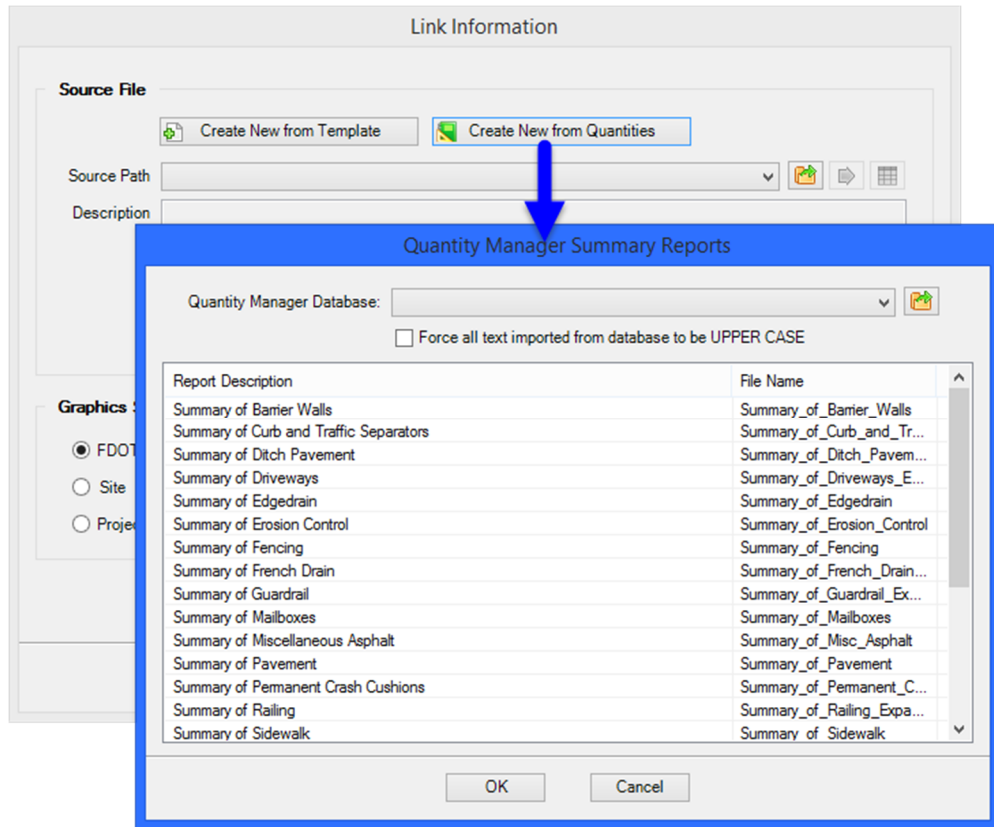
## Exercise 11.3    *Create Tabulation of Quantities Sheet from Quantities*

1. Continuing in the MicroStation file *CLIPSP01.dgn,* on the FDOT Menu, select **Actions > Create File/Project**.

2. Set the *File Group* to **Signing & Pavement Marking Files (DGN),** on the *File Type* list, select **Tabulation of Quantities Sheets** and click **Create**.
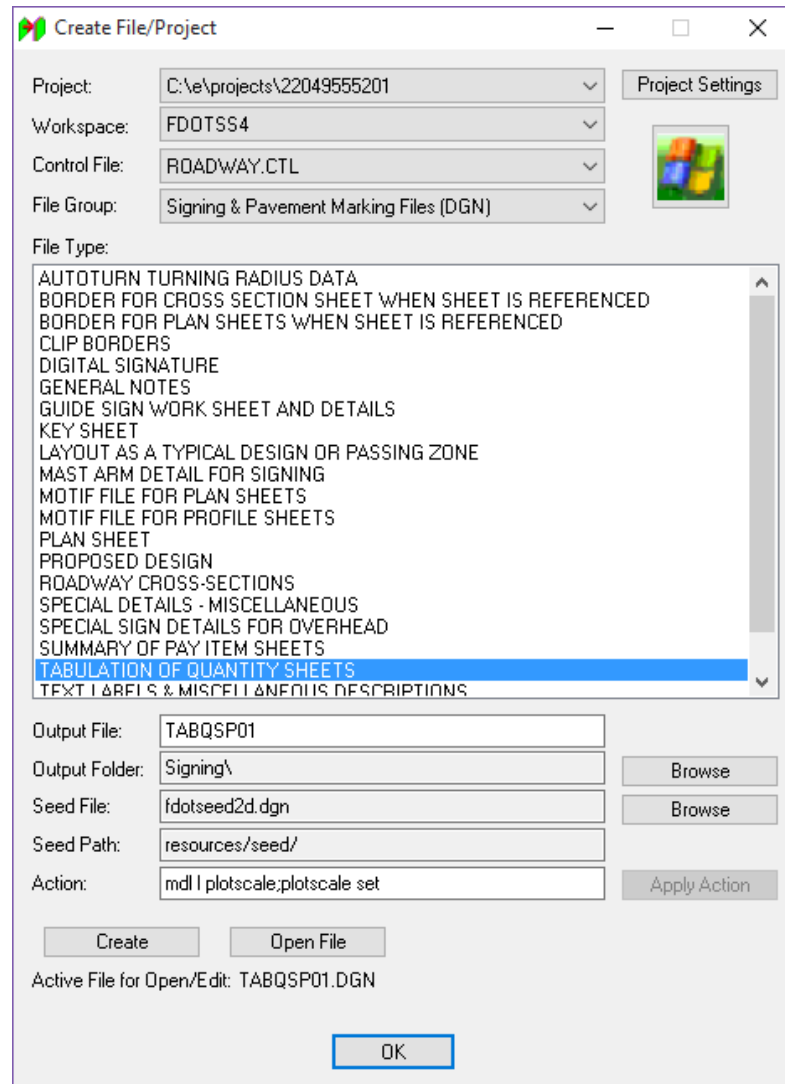


3. Click **OK** confirming that the file successfully created.

4. Select **Open File** to open the new file.

5. Upon opening, click **OK** on the Set Plot Scale dialog, and then **OK** on the Create File/Project dialog to close it.

6. From the *FDOT Plans Development > Quantities* Tasks menu, select the **Linked Data Manager** icon to open LDM.
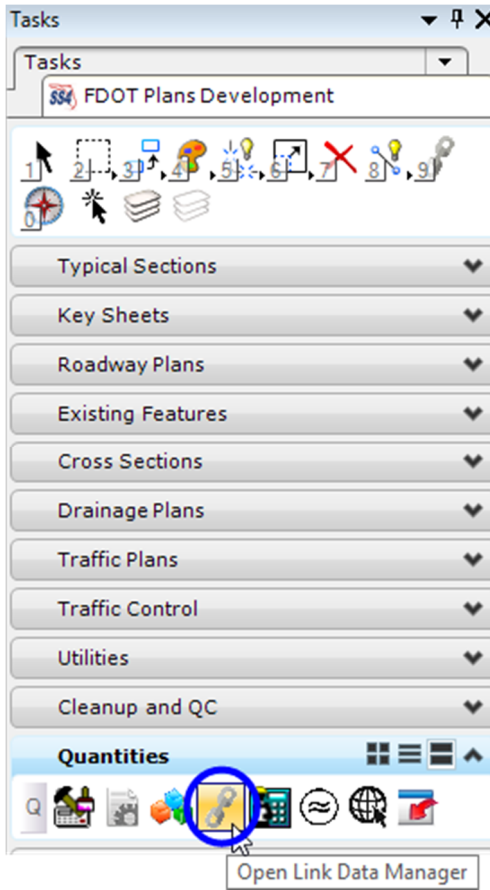


7. From LDM, select the **Create Link** button.
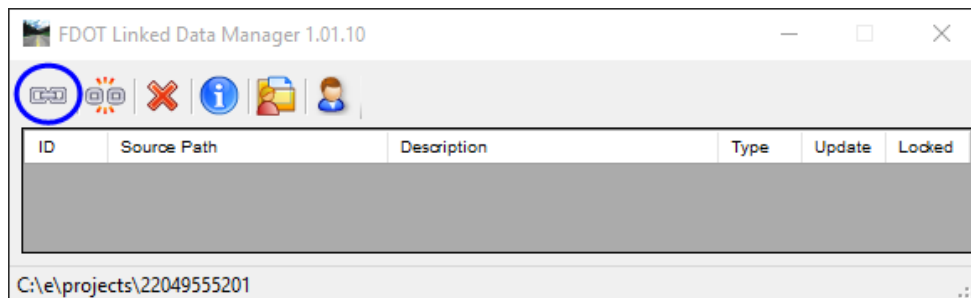


8. On the Link Information dialog, select the **Create New from Quantities** button.
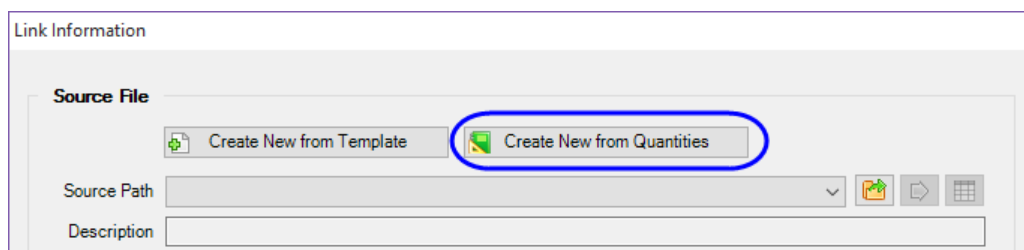
9. From the **Quantity Manager Summary Reports** dialog, click the **Browse** button and select the database file *22049555201.mdb*.

10. Check **On** the option to *Force all text imported from database to be UPPER CASE*.

11. Select the **Tabulation of Quantities** report from the list and click **OK**.
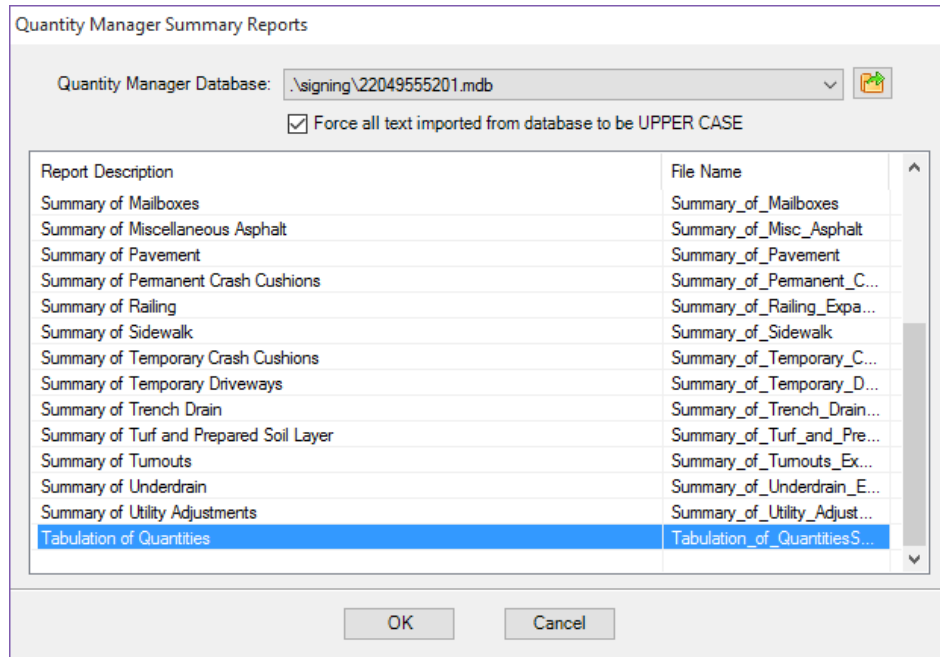


12. Save the Excel file to the project discipline sub-directory, **Signing**.

13. On the Link Information dialog, the *Source Path* populates. Complete the dialog as shown below and click **OK**.
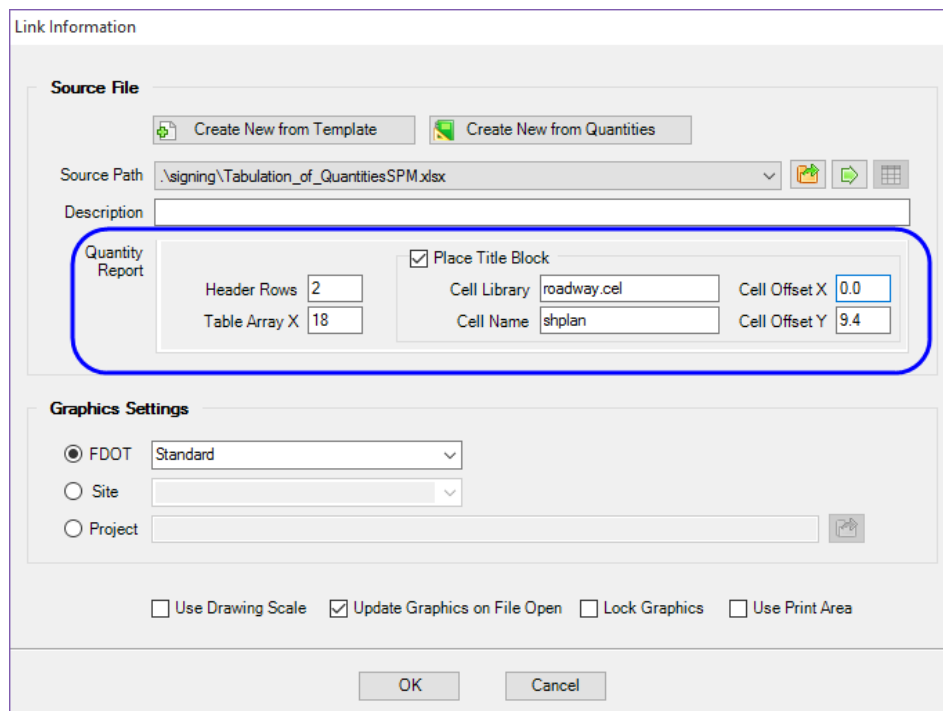
14. Data Point in the design file to place the sheet.



| PAY ITEM NO. | DESCRIPTIO |
|---|---|
| 0700  1 11 | SINGLE POST SIGN FURNISH&INSTALL LESS THAN 12 |
| 0700  1 12 | SINGLE POST SIGN, FURNISH & INSTALL, 12-20 |
| 0700  1 74 | SINGLE POST SIGN, FURNISH & INSTALL, MORE THAN |
| 0700  2 12 | MULTI-POST SIGN, FURNISH & INSTALL, 12 |
| 0700  2 13 | MULTI-POST SIGN, FURNISH & INSTALL, 21 TO 30 |
| 0700  2 18 | MULTI-POST SIGN, FURNISH & INSTALL, 12 |
| 0706  3 | RETRO-REFLECTIVE PAVEMENT MARKER |
| 0710 11101 | PAINT, STD., WHITE, SOLID, 6" |
| 0710 11102 | PAINT, STD., WHITE, SOLID, 8" |
| 0710 11123 | PAINT, STD., WHITE, SOLID, CROSSWALK/RA, 12" |
| 0710 11124 | PAINT, STD., WHITE, SOLID, DIAG./CHEVRON, 18" |
| 0710 11125 | PAINT, WHITE, SOLID, STOP LINES/CROSSWALK, 24" |
| 0710 11131 | PAINT, STD., WHITE, SKIP, 6" (10/30) |
| 0710 11141 | PAINT, STD., WHITE, DOTTED EXT., 6" (6/10) |
| 0710 11160 | PAINT, STD., MESSAGE OR SYMBOL (MERGE) |
| 0710 11170 | PAINT, STD., ARROWS (MERGE) |
| 0710 11201 | PAINT, STD., YELLOW, SOLID, 6" |
| 0710 11224 | PAINT, STD., YELLOW, SOLID, DIAG/CHEVRONS, 18" |
| 0710 11241 | PAINT, STD., YELLOW, DOTTED EXT., 6" (6/10) |
| 0710 11290 | PAINT, STD., YELLOW, ISLAND NOSE |
| 0711 11123 | THERMO., STD., WHITE, SOLID, CROSSWALK/RA, 12" |
| 0711 11124 | THERMO., STD., WHITE, SOLID, DIAG./CHEVRONS, 18" |
| 0711 11125 | THERMO., STD., WHITE, SOLID, STOP LINE, 24" |
| 0711 11141 | THERMO., STD., WHITE, DOTTED EXT., 6" (6/10) |
| 0711 11160 | THERMO., STD., MESSAGE OR SYMBOL (MERGE) |
| 0711 11170 | THERMOPLASTIC, ARROWS |
| 0711 11224 | THERMO., STD., YELLOW, SOLID, DIAG./CHEVRONS, 18" |
| 0711 11241 | THERMO., STD., YELLOW, DOTTED EXT., 6" (6/10) |
| 0711 14125 | THERMO., PREFORMED, WHITE, SOLID, 24" |
| 0711 14160 | THERMO., PREFORMED, MESSAGE OR SYMBOL (BIKE) |
| 0711 14170 | THERMO., PREFORMED, ARROWS (BIKE THRU) |
| 0711 15101 | THERMO., STD. - OPEN GRADE, WHITE, SOLID, 6" |
| 0711 15102 | THERMO., STD. - OPEN GRADE, WHITE, SOLID, 8" |
| 0711 15131 | THERMO., STD. - OG, WHITE, SKIP, 6" (10/30) |
| 0711 15201 | THERMO., STD. - OPEN GRADE, YELLOW, SOLID, 6" |

*Note*     *Notice that the items included with pay item 710-90 are shown with the pay item numbers. These should have an "*" shown instead. Also note that some of the items like the arrows and messages are shown totaled together per pay item and not broken out by type of marking. Depending on the District, these items may need to be broken out by type in the sheet.*

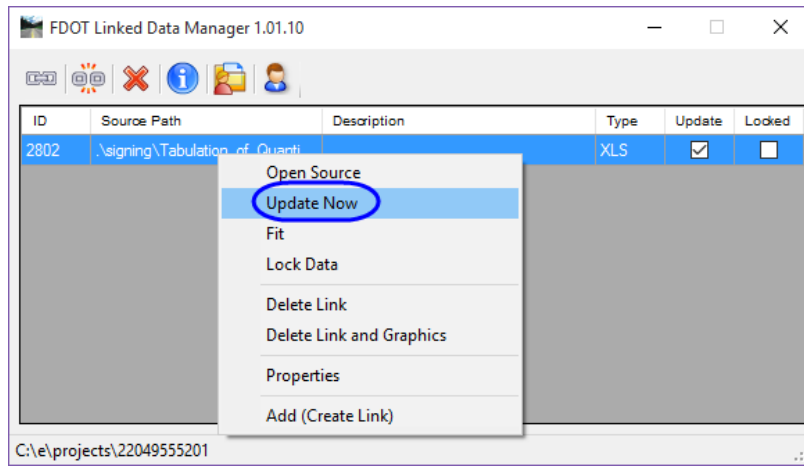15. Right-click on the new link in the LDM dialog and select **Open Source**. Excel opens.
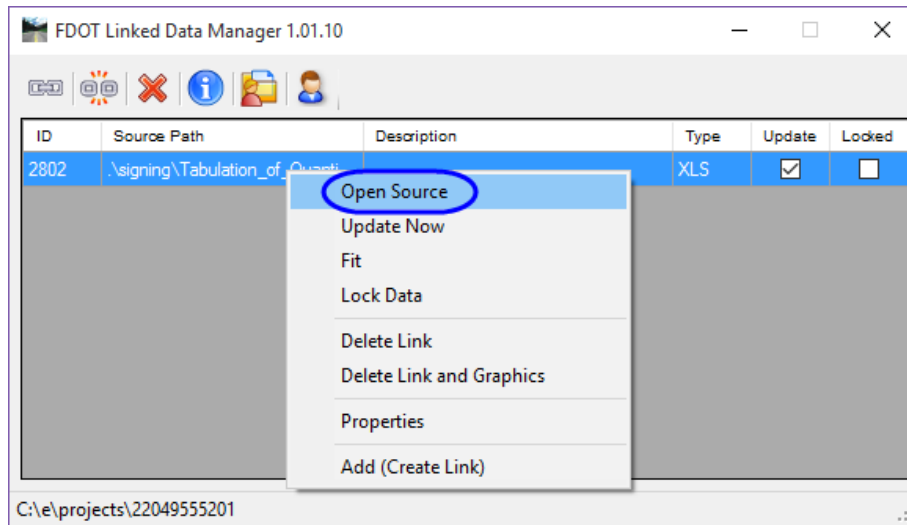


16. In Column A, select the pay item 0706 3 for the Retro-reflective Pavement Markers. Type in an asterisk (*).

17. Using the cursor, select the green square at the bottom right corner of the cell and drag it down to copy the value to the paint items. (Do not include the pay item 0710 11290, Paint, Std. Yellow, Island Nose. This item is not included in the 710-90 pay item.)
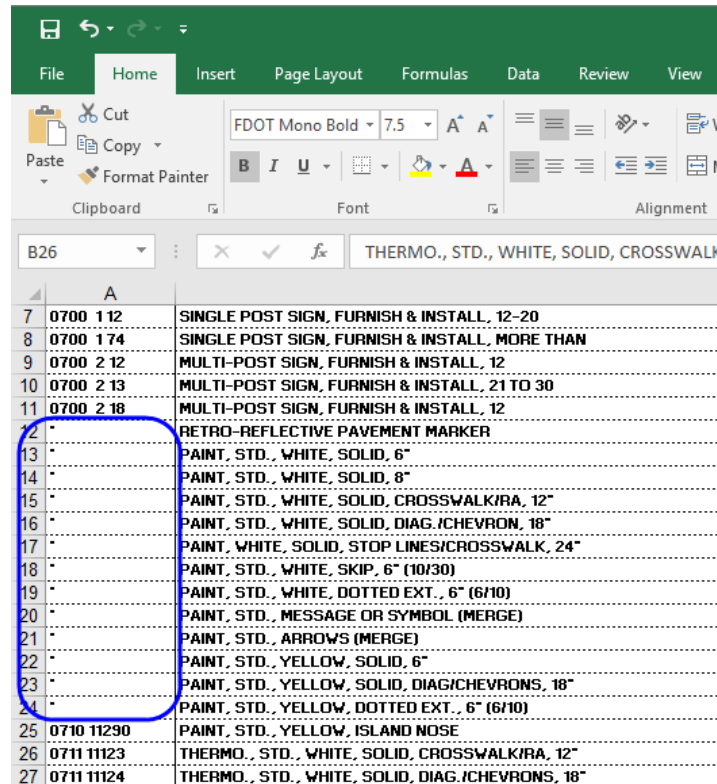


*Hint*    Hold down the *shift* key in Excel to select multiple worksheets when the same change needs to made for multiple sheets. Don't forget to Un-Group the worksheets when finished before modifying individual cells or text.

18. Select **File > Save** to save the changes in the Excel file.

19. In MicroStation, right-click on the link in *LDM* and select **Update Now**.