

AUTOCAD® MEP 2009

Creating Custom Panel Schedules with AutoCAD MEP 2009

In AutoCAD® MEP 2009 software, electrical panel schedules are created with AutoCAD® software tables instead of being generated by Microsoft® Visual Basic® code, as in AutoCAD MEP 2008 and earlier releases. This white paper explains the new panel schedules in more detail and provides an overview of how users can create their own custom panel schedules that match their company standard schedules.

Understanding AutoCAD Tables and Field Codes

The user should be familiar with how to create and edit AutoCAD tables. Tables are AutoCAD objects, unlike schedules, which are AutoCAD[®] Architecture software objects and AutoCAD MEP objects. While typical AutoCAD MEP schedules are maintained and edited in Style Manager, tables are maintained through AutoCAD software's Table Style dialog box. You can find more information about tables and table styles in the help documentation (AutoCAD Help>User's Guide>Annotate Drawings>Tables).

Several different sample panel schedule table styles are included in AutoCAD MEP 2009. These table styles are located in the panel schedule table styles drawing found in the Styles folder (example for US Imperial is c:\Documents and Settings\All Users\Application Data\Autodesk\ACD-MEP 2009\enu\Styles\Imperial\Panel Schedule Table Styles (US Imperial).dwg for Microsoft Windows XP software).

AutoCAD MEP 2009 electrical panel schedules also utilize AutoCAD field codes to populate the panel schedules with information from Circuit Manager. Please refer to the Help documentation (AutoCAD Help>Annotate Drawings>Notes and Labels>Use Fields in Text>Insert Fields) for more information about inserting fields into Tables. New special Field Codes (AEC Panel and AEC Circuit) have been created for use in panel schedules tables.

New Circuit Manager Information

New header and footer sections are in Circuit Manager for AutoCAD MEP 2009 to show more information about each panel. The header section contains information about the panel, such as voltage, rating, main size, enclosure type, and so forth. The footer section displays total panel load values as well as load breakdown by load category (with applicable demand factor), spare capacity, and phase balance.

The middle section of Circuit Manager contains the circuit data for each panel. This section has been updated to show more relevant information (such as circuit total load, load on each phase) but is very similar to what appears in Circuit Manager in prior releases.

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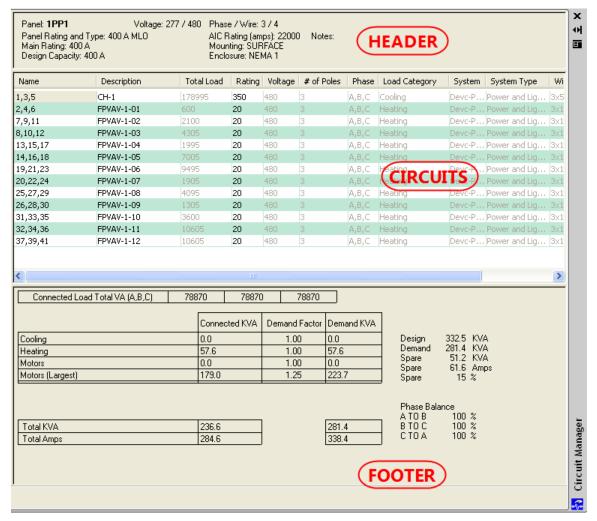


Figure 1: New Circuit Manager configuration for AutoCAD MEP 2009

Panel and Circuit Field Codes

As mentioned in the section above, the header and footer sections of Circuit Manager contain panel data while the center section contains circuit data. Every piece of data in Circuit Manager has a corresponding field code (either AEC Panel or AEC Circuit) that can be inserted into a panel schedule table style. When the panel schedule is inserted into a drawing, the field code displays the appropriate value.

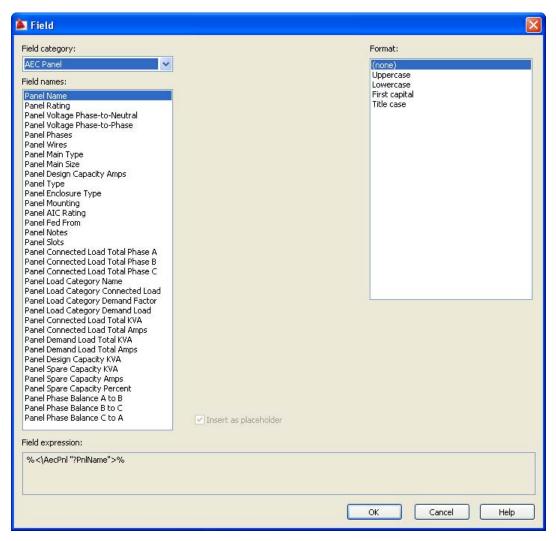


Figure 2: New AEC Panel field codes

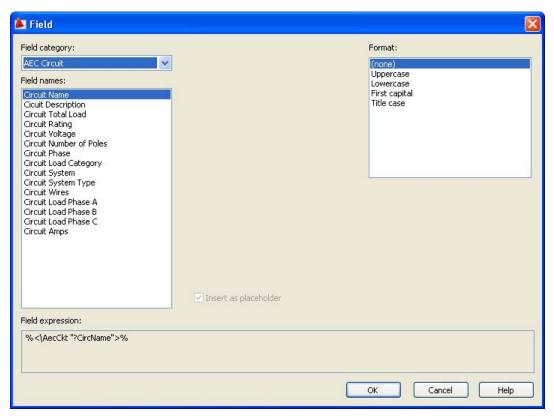


Figure 3: New AEC Circuit field codes

Panel Schedule Table Styles

Now that you have an understanding of AutoCAD tables, field codes, and the data available in Circuit Manager, we will review how these are used to create electrical panel schedules in AutoCAD MEP 2009. Open the panel schedule table style drawing (c:\Documents and Settings\Undersubset\Undersubs

			-	PANEL	?PnIName							
VOLTAGE (L	N):	?PnIVPN			ENCLOSUR	TYPE:	?PnlEncl				-	
VOLTAGE (L-L): ?PnIVPP				MOUNTING:	MOUNTING:					-		
			φ ?PnlW	ires W		AIC RATING (A):		?PniMtg ?PniAlC				
		?PnIRtq			NOTES:							
		?PnIMnS	ize									
CKT NO	PHAS PAIS PHAS		PHASE LOADS (VA)	(VA)		TRIIP	DEC	CRIPTION	CKT NO			
CKI NO	DESCRIPTION	AMPS	FOLE	A	В	C	POLE	AMPS	DES	CRIPTION	CKINO	
?CircName	?CircDesc			?CircLoadA ?CircLoadA					?CircDesc		?CircName	
?CircName			?CircPls		?CircLoadB ?CircLoadE				?CircDesc		?CircName	
?CircName	?CircDesc	?CircRtg	?CircPls			?CircLoadC ?CircLoadC	?CircPls	?CircRtg	?CircDesc		?CircName	
		CONNECTED LOAD PHASE TOTALS (VA)										
		?PnlConnA	?PnlConnB	?PnlConnC								
		CONNECTED LOAD						?PnIDmKVA KVA				
			(KVA)	DEMAND FACTOR	DEMAND LOAD (KVA)			SPARE CAPACITY	?PnISKVA KVA			
?PnILCName			?PnILCCLoad	?PnlLCDmF	?PnlLCDmLoad			SPARE CAPACITY	?PnlSAmp AMPS			
	?PnILCName			?PnILCCLoad	?PnILCDmF	?PnlLCDmLoad	SPARE CAPACITY ?PnlSprPct %			?PnlSprPct %		
	?PnILCName			?PnILCCLoad	?PnILCDmF	?PnILCDmLoad	PHASE BALANCE					
	?PnILCName			?PnILCCLoad	?PnlLCDmF	?PnlLCDmLoad			A TO B	?PnlBalAtoB%		
?PnILCName			?PnILCCLoad	?PnILCDmF	?PnlLCDmLoad				?PnlBalBtoC %			
	?PnILCName			?PnILCCLoad	?PnILCDmF	?PnILCDmLoad			C TO A	?PnIBalCtoA %		
?PnILCName			?PnILCCLoad	?PnILCDmF	?PnlLCDmLoad							
	TOTAL:			?PnICKVA		?PnIDmKVA						
	LOAD (AMPS):			?PnlCAmp		?PnIDmAmp						

Figure 4: Sample layout of Three-Phase Branch Circuit Panel table style

One important thing to note is that the circuit section of the panel schedule table only shows a few rows (three rows in this example). This is because panel schedules can vary in the

number of circuits they contain. Instead of creating different schedules for every possible circuit configuration, only "unique" rows need to be created.

In this example for a three-phase branch circuit panel, we want circuits 1 and 2 to display load values in Phase A, circuits 3 and 4 to display load values in Phase B, and circuits 5 and 6 to display load values in Phase C. We can stop at this point because circuits 7 and 8 need to display load values in Phase A again, similar to the first row, so this is no longer a unique row. The circuit section we have created will continue to repeat itself until all of the circuit data has been populated on the panel schedule that is inserted into a drawing.

The circuit field codes are coded with special behavior that allows them to repeat until all of the circuits have been added. As such, only circuit field codes are allowed in a "circuit row" in the panel schedule tables. If any other type field code appears in a row with circuit field codes, the panel schedule is invalid and it cannot be inserted into a drawing.



Figure 5: Circuit section of Three-Phase Branch Circuit Panel table style

More information about how to create a panel schedule table follows in the next section.

Creating a Panel Schedule Table

The easiest way to create a panel schedule table is to start from an existing Microsoft Excel[®] software schedule and copy it in to AutoCAD MEP.

Start a new drawing in AutoCAD MEP software, preferably using a "clean" AutoCAD template file such as *acad.dwt*. This will help keep the file size small and ensure that no Autodesk Architecture or AutoCAD MEP objects are present in the drawing. If you use the AutoCAD template you will need to edit the text style (Style command) to match your company standards and set it current before importing your table from Excel to minimize additional clean-up time.

Open your existing Excel panel schedule, and save it as something else. This is important because you need to remove any unneeded circuit rows. Also, you should merge as many of the blank cells together as possible prior to bringing into AutoCAD MEP. This will make the table creation process much easier.

The sample Excel file used as the basis for the three-phase panel schedule table in AutoCAD MEP 2009 is shown below. Notice that the circuit section only contains the three unique rows as previously mentioned.

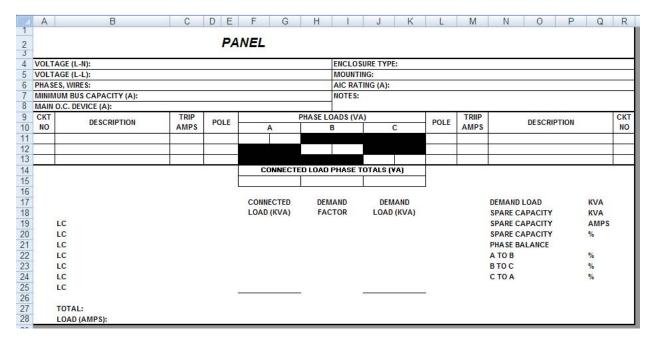


Figure 6: Sample Microsoft Excel file used as starting point for table style

After editing your Excel file, start a new drawing in AutoCAD MEP based on the *acad.dwt* template file. Be sure that the scale is set to 1:1 to allow the panel schedule to scale properly when it is inserted into a drawing. Select all of the cells in Excel, copy it, then select Paste Special as AutoCAD Entities into your drawing. **Tip: Be sure to paste the file in the positive X,Y coordinate section and place it on Layer 0.**

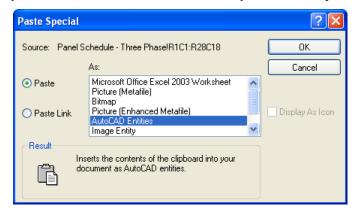


Figure 7: Select AutoCAD Entities in the Paste Special dialog box

The result should be a table that closely approximates the version you had in Excel.

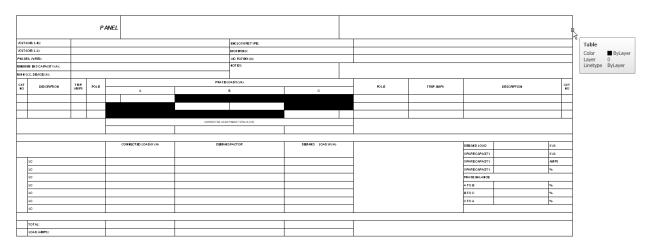


Figure 8: New table created in AutoCAD MEP drawing

This is probably a good time to mention that you should be saving often throughout this process!

You will need to alter some of the cells widths to more closely match your desired final version, but this is a much easier process than trying to create a new schedule directly in AutoCAD MEP. The table may also have additional border lines that need to be deleted, such as the lines in the top row of Figure 8 above and in several rows in the footer section.

It can very difficult to determine which cells have borders and which ones are just displaying the cell gridlines (similar to Excel). The easiest way to determine the difference is to do a plot preview. This will quickly show which items are borders (that will plot) and which one are just gridlines, which will not plot. If you receive an error message while trying to do a plot preview, be sure to set things up in the Page Setup Manager (File>Page Setup Manager...).

While most of the borders from Excel will come across, the thickness (lineweight) may not be retained. You should format the border widths as desired in AutoCAD MEP to get the preferred look of the schedules. To edit borders, select a table cell (or multiple cells), right-click, and select the Borders option.

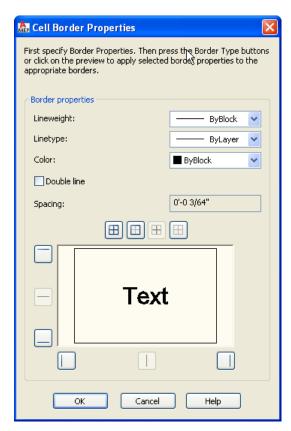


Figure 9: Cell Border Properties dialog box

You should also set the border color, border lineweight, and text color to be ByBlock and the linetype to ByLayer unless you want to force a specific value. The Row Style should *always* be set to Data (do not use Header or Title) and the Data Type should *always* be set to Text for all cells. All of these settings are found in the Properties Palette.

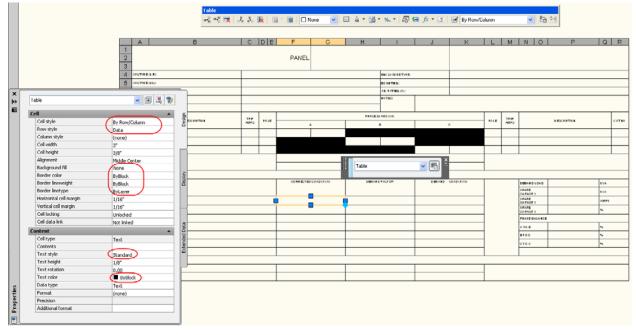


Figure 10: Table properties in Property Palette

One additional thing to check is to make sure that Color of each Text entry is set to ByBlock. To do this you must manually edit each cell, but this is critical to ensure that all of the text is inserted properly. When the original file was copied from Excel, a lot of the text color was set to 0,0,0. Edit the text in each cell and set the color to ByBlock. Do this also for the cells in which you will be adding field codes.

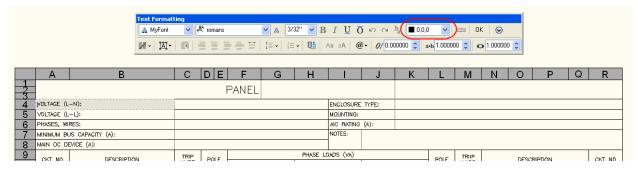


Figure 11 - Incorrect setting of 0,0,0 for text color in table

Once you have modified the layout, borders, cell heights and widths, text styles, and so on, and input all of your "static" text, you should do a final plot preview to quickly verify things look as desired.

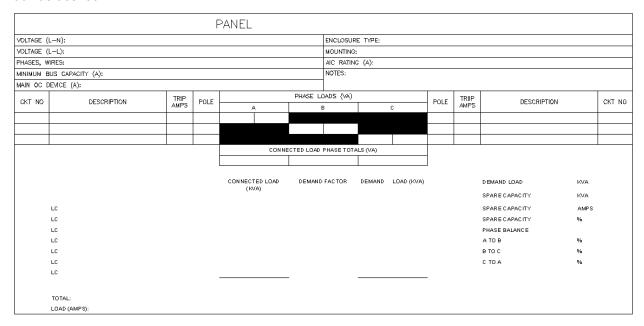


Figure 12: Example of plot preview for table style

Now, it is time to add your field codes to make sure your schedules use and display the correct data from Circuit Manager.

Adding Field Codes

The process of adding field codes for panel schedules is the same as inserting them into a regular table. Double-click in a text cell to be in edit mode, then right-click and select Insert Field.... Select the desired panel or circuit field code to display the desired information. The pictures below show how the AEC Panel and AEC Circuit field codes match up with the items in the header, footer, and circuit sections of Circuit Manager.

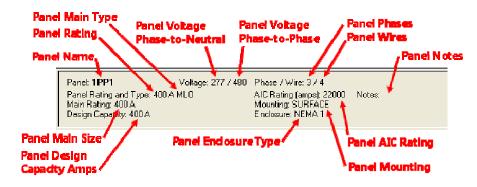


Figure 13: Circuit Manager header section

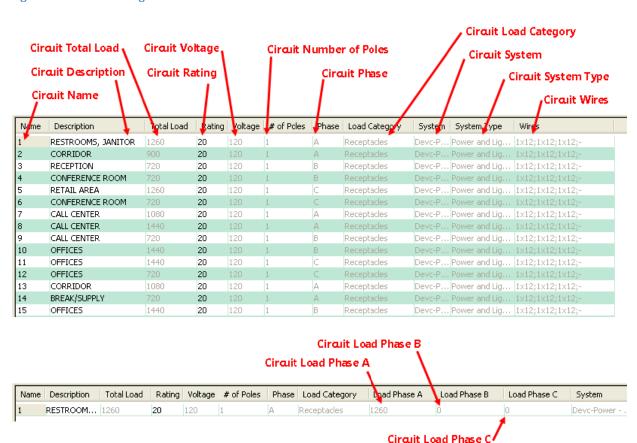


Figure 14: Circuit Manager circuit sections

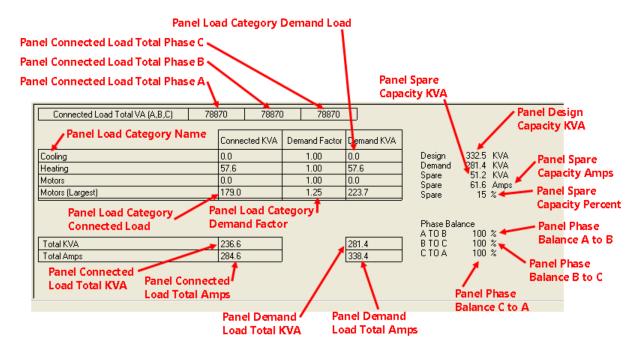


Figure 15: Circuit Manager footer section

Here are some rules that must be followed when using the panel and circuit field codes in tables.

- Circuit field codes are unique because of their "repeating" behavior. As noted in an
 earlier section, you cannot have anything but circuit field codes in a row in your panel
 schedule table. If any other types of field codes are found in the same row as a circuit
 field code, the panel schedule will not be generated.
- 2. It is not possible to use the circuit load field codes (Circuit Load Phase A, Phase B, Phase C) in the same table as the circuit total load field code. Refer to the existing styles as examples—the branch circuit panels utilize the circuit phase load fields while the switchboard and distribution boards use the circuit total load field.
- 3. Panel load category field codes (Name, Connected Load, Demand Factor, Demand Load) also have a "repeating" behavior because the number of load categories on a panel will vary depending on the types of loads connected to it. If any other type of field code is in the same row as the panel load category fields, the row will not repeat. If only panel load category fields are in a row, the row will repeat until all of the load category rows have been populated. For a better understanding of this, refer to the load category section at the bottom of the distribution board schedule.

DISTRIBUTION BOARD ?PnIName										
PRIMPN/PPNIMP VOLTS PRIMP PRIMPSize AMP PRIMPType								A.I.C. RATING		
ELIMATIA A SELIMATE A SELIMATIA A SELIMA			1100 17	?PnlDsnAmp		1980		MOUNTED		
CKT NO. TRIP/ POLES DESC				SCRIPTION DEMAN			WIRE SIZE			
?CircName	?CircRtg/?CircPla	?CircDesc				?CircLoad	?CircWires			
Load Category Co				acted Load (VA) x	Demand Factor =	Demand Load (KVA)		TOTAL CONN. LOAD:	?PnICKVA	KVA
?PnILCName				ILCCLoad	?PnILCDmF	?PnlLCDmLoad	T-	OTAL DEMAND LOAD	?PnIDmKVA	¥VΑ
?PnlLCName				ILCCLoad	?PnILCDmF	?PnlLCDmLoad	T-	OTAL DEMAND LOAD:	?PnlDmAmp	AMPS
?PnILCName 3				ILCCLoad	?PnILCDmF	?PnlLCDmLoad		SPARE CAPACITY	?PnlSAmp	MPS
?PnILCName	?PnILCName ?				?PnILCDmF	?PnlLCDmLoad				

Figure 16: Distribution Board Schedule table style

The first three rows contain panel load category fields as well as other fields on the right (as marked above). These rows will not be repeated, but the fourth row only contains panel load category fields so it will repeat as many times as necessary to include all of the load categories on the panel. In the example below, there are eight load categories and the table automatically adjusts to include all of them.

DISTRII	BUTION BO	DARD MDP						
		3 ф 4 W	1200	A AMP MCB		65000 A.I.C. RATING		
			1200	A AMP BUS		SURFACE MOUNTED		
CKT NO.	TRIP/ POLES	DESCRIF	MOIT		DEMAND LOAD VA	WI	RE SIZE	
1,3,5	400/3	PANEL BPP1			198390	<undefined></undefined>		
2,4,6	400/3	PANEL 1PP1			281359	<undefined></undefined>		
7,9,11	200/3	PANEL 2PP1			55590	<undefined></undefined>		
8,10,12	200/3	PANEL 3PP1			64890	<undefined></undefined>		
13,15,17	40/3	PANEL BLP1			5133	<undefined></undefined>		
14,15,18	40/3	PANEL 1LP1			17020	<undefined></undefined>		
19,21,23	40/3	PANEL 2LP1			28900	<undefined></undefined>		
20,22,24	40/3	PANEL 3LP1			27820	<undefined></undefined>		
25,27,29	100/3	PANEL 1RP1 via Transfor	mer		14270	<undefined></undefined>		
26,28,30	100/3	PANEL BRP1 via Transfor	mer		4680	<undefined></undefined>		
31,33,35	200/3	PANEL 2RP1 via Transfor	mer		24350	<undefined></undefined>		
32,34,36	200/3	PANEL 3RP1 via Transfor	mer		24588	<undefined></undefined>		
Load Catego	pry		ted Load (A) x	Demand Factor =	Demand Load (KVA)	TOTAL CONN.	LOAD:	702.1 KVA
Cooling 133			32.0	1.00	132.0	TOTAL DEMAND	LOAD:	717.4 KVA
Equipment 2.			2.4	1.00	2.4	TOTAL DEMAND	LOAD:	862.9 AMPS
Heating 212			12.8	1.00	212.8	SPARE CA	PACITY:	337.1 AMPS
Lighting 63.			B3.1	1.25	78.9			
Motors 12.2			12.2	1.00	12,2			
Motors (Largest) 179.0			79.0	1.25	223.7			
Receptacles (0 - 10 KVA) 10.0			0.0	1.00	10.0			
Receptacle	Receptacles (Over 10 KVA) 9			0.50	45.3			

Figure 17: Example of a Distribution Board Schedule inserted into a drawing

Creating the Table Style

Once the formatting, text, and borders have been set up as desired and all of the field codes have been added, you are ready to create the table style to use for your panel schedules. Be sure to save your drawing then type Tablestyle at the command line and click the New... button.

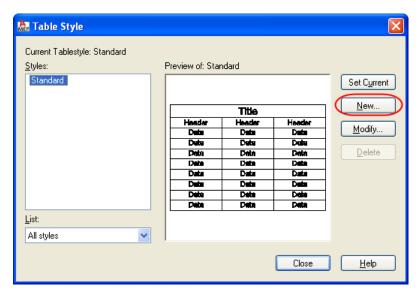


Figure 18: Table Style dialog box

Another dialog box appears asking for the new style name. Give your schedule a meaningful name such as 3-Phase Panel. The New Table Style dialog box appears and all of the settings should remain as-is, do not make any changes. The only thing to do is click on the button to select a starting table style to use.

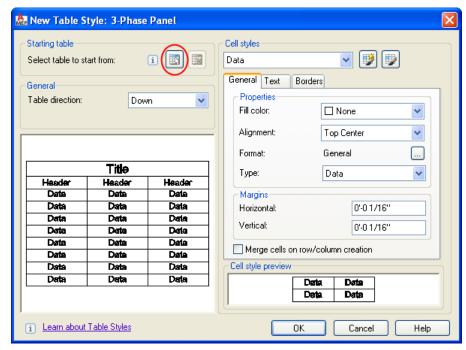


Figure 19: New Table Style dialog box

After a table has been selected, the Preview window updates to show the new table.

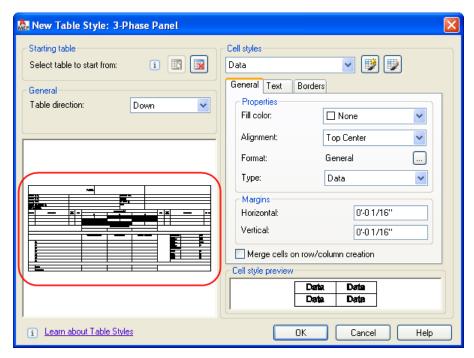


Figure 20: New Table Style dialog box with updated preview image

Click OK, then click Close on the Table Style dialog box and save your drawing. You now have a panel schedule table style that can be used for your electrical panel schedules. Repeat the process until you have created all of the desired panel schedule table styles that you need. You can create Tool Palette tools that point to this table style to facilitate the insertion of panel schedules.

Modifying a Panel Schedule Table

When modifying a panel schedule table style, you will need to reassign the style in the Table Style dialog after making your revisions to the table.

To do this, make the necessary changes to the table style and save the drawing. Then type in Tablestyle to launch the dialog box shown previously. Select the name of the table to update then click the Modify... button.

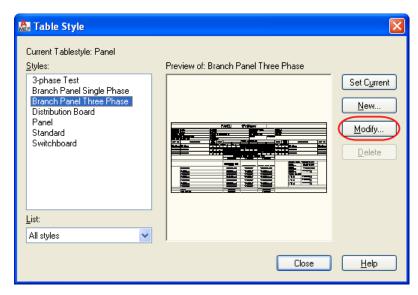


Figure 21: Table Style dialog box

In the next dialog box, click the button in the Starting Table section in the upper-left side of the dialog box.

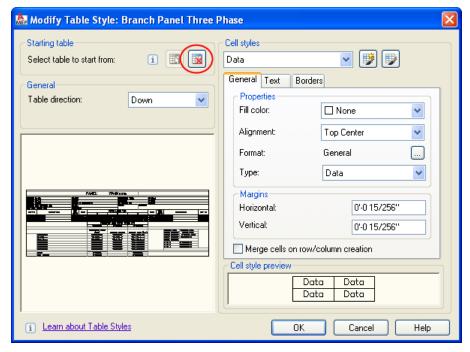


Figure 22: Modify Table Style dialog box

Then click the Start From button and choose the updated table in the drawing. Click OK for this dialog then click Close on the Table Style dialog. Save the drawing and the updated table is now ready to be used.

Using a Panel Schedule Table Style to Add Panel Schedules

Once your table styles have been created, you are ready to use them in your construction documents. Your new panel schedule table style can be selected in the dialog box every time you run the PanelAdd command. Browse to find the file in the panel schedule style location

section then choose the desired panel schedule table style. In this example, we have created a new style called "MyCompanyPanel":

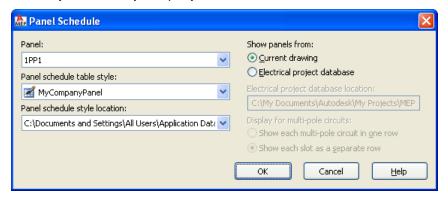


Figure 23: Panel Schedule Add dialog box

A better way to use your new panel schedule table style is to create a tool on the Tool Palette with settings already predefined. Several panel schedule tools are currently available on the Tag & Schedule tab of the Electrical Tool Palette.

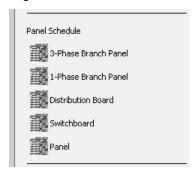


Figure 24: Panel Schedule tools on Properties Palette

To create a new tool, right-click on an existing tool, select Copy then right-click in an empty area of the Properties Palette and select Paste. The new tool will appear at which point you can right-click on it and select Properties.

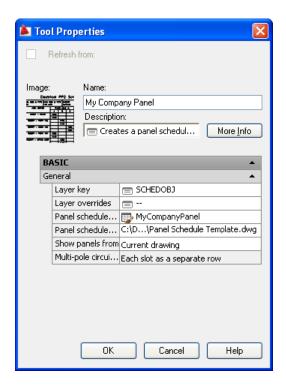


Figure 25 - Tool Properties dialog box

Change the name to something meaningful then make the desired selections for layer key, drawing that contains the table style, and whether your panel data is always found in the current drawing or in an electrical project database (using the EPD is the preferred method). Click OK to close the dialog then drag the tool to the desired location on the Properties Palette.

Now, whenever you click the tool, the Panel Add dialog will be prepopulated with all the correct settings.

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