

There's a reason reliability is so important to us. We live here too.



2017

MID-WEST EUUG CONFERENCE COMPLEX SYMBOLOGY



**Muscatine
Power and Water**

Reliable. Responsive. Responsible.

Introduction

- Muscatine Power & Water (MP&W) started using CableCAD in 1989.
- In early 1990, the Electric and Water mapping was converted from manual maps to CableCAD.
- In 2002, the Electric and Water mapping was converted to ESRI & ArcFM.
- In 2014, the Electric and Water mapping removed ArcFM and now uses native ArcMap.
- In 1998, construction began on the MP&W's Communications Utility. Initial mapping was done using CableCAD/HFC. HFC was a CATV package written specifically for this industry.
- In 2007, the Communications mapping was converted from HFC to Network Engineer, due to the demise of the CableCAD/HFC software.
- In 2009, the Communications mapping was converted from Network Engineer to Condor. A fiber management software package by Ptarmigan Software.

What is Complex Symbology?

Complex Symbology is a technique to make more information available to the end user without an extensive amount of labeling or annotation.



An example is the RUS three phase pad mounted transformer symbol.



vs the MP&W three phase pad mounted transformer symbol.

What can we determine from this symbol?



- The **RED** symbols are associated with 13.8kv primary voltage.
- Grounded 3 phase pad mounted transformer.
- 277/480 grounded Y secondary voltage.
- ID number 3806.
- 112.5 kVA.
- Serves 1 customer (meter).
- This transformer serves critical infrastructure (Traffic Signals, Sewer lift stations, CATV power supplies).

Why use complex symbology

- MP&W operates three separate utilities:
 - ❖ Electric.
 - ❖ Water.
 - ❖ Communications.
- Engineers need to see all three utilities on a map at the same time and must be able to distinguish each utilities features from the other.

MP&W Electric legend

Legend		Feature Type, Customer Owned		Subtype, Secondary Voltage		Single-Phase OH		Subtype OH		Subtype OH		Subtype OH		Subtype OH	
	COTV Power Supply		H/Un, No		Single Ph OH - 120		Single Ph OH - 120/240		Service 1gh		Overhead Disconnect		Overhead Disconnect		Overhead Disconnect
Electric Hyperlinks		Substation Three-Line Diagram		Subtype, Operating Voltage		Subtype, Operating Voltage		Subtype, Operating Voltage		Subtype, Operating Voltage		Subtype, Operating Voltage		Subtype, Operating Voltage	
	General Information		Cobra, No		Two Ph OH - 240 OD		Two Ph OH - 480 OD		Service 2gh		Overhead Load Break		Overhead Load Break		Overhead Load Break
	Traffic Signal		Decorative, No		Three Ph OH - 120/240 GY		Three Ph OH - 480 D		Security Light Conductor		Underground Disconnect		Underground Disconnect		Underground Disconnect
Customer Security Lights			LED-Decorative, No		Three Ph OH - 120/240 Y		Three Ph OH - 480 D		Customer Owned 1gh		Underground Load Break		Underground Load Break		Underground Load Break
	LED-Decorative, Y		LED-Cobra, No		Three Ph OH - 277/480 GY		Three Ph OH - 480 D		Customer Owned 2gh		Overhead Evaporation		Overhead Evaporation		Overhead Evaporation
	LED-Decorative, No		LED-Cobra, Yes		Three Ph OH - 277/480 Y		Three Ph UG - 120/240		Security Light Conductor		Underground Evaporation		Underground Evaporation		Underground Evaporation
	LED-Flood, No, OH		LED-Colonia, No		Single Ph UG - 120/240		Three Ph UG - 277/480 GY		Customer Owned 1gh		Underground Evaporation		Underground Evaporation		Underground Evaporation
	LED-Flood, No, UG		LED-Shoe Box, No		Three Ph UG - 277/480 Y		Three Ph UG - 240/4160 GY		Customer Owned 2gh		Overhead Disconnection		Overhead Disconnection		Overhead Disconnection
	Security Light, Y, UG		LED-Shoe Box, Yes		Three Ph UG - 277/480 Y		Three Ph UG - 240/4160 GY		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Security Light, No, UG		LED-Flood, Yes		Three Ph UG - 240/4160 GY		Three Ph UG - 277/480 Y		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Security Light, No, OH		Pole Top Luminaire, No		Three Ph UG - 277/480 Y		Three Ph UG - 240/4160 GY		Customer Owned 1gh		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Security Light, No, OH		Pole Top Luminaire, Yes		Three Ph UG - 240/4160 GY		Three Ph UG - 277/480 Y		Customer Owned 2gh		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Security Light, Yes, OH		Shoe Box, No		Three Ph UG - 277/480 Y		Three Ph UG - 240/4160 GY		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Security Light, Yes, OH		Shoe Box, Yes		Three Ph UG - 240/4160 GY		Three Ph UG - 277/480 Y		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
Service Points			Service Point		Three Ph UG - 277/480 Y		Three Ph UG - 240/4160 GY		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	LED-Decorative, No, UG		Subtype, Status, CRITICAL SERVICE		Three Ph UG - 240/4160 GY		Three Ph UG - 277/480 Y		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	LED-Decorative, No, OH		MW, Active, No		Foreign Owned - 120/240		Three Ph UG - 240/4160 GY		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	LED-Flood, No, OH		MW, Active, Yes		Power Transformers		Three Ph UG - 277/480 Y		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	LED-Flood, No, UG		MW Demand, Active, No		Connection Points		Three Ph UG - 480 D		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Security Light, Y, UG		MW Demand, Active, Yes		Wind Turbine		Three Ph UG - 240 D		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Security Light, No, UG		MW Inactive, Active, No		MPW Style Solar Panel		Three Ph UG - 277/480 Y		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Security Light, No, OH		MW Inactive, Active, No		Solar Panel		Three Ph UG - 240/4160 GY		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Security Light, No, OH		MW Inactive, Inactive, No		Street Light Poles		Three Ph UG - 277/480 Y		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Security Light, Yes, OH		MW Inactive, Inactive, No		MA (E) (R) (L) (C) (W) (N) (E) (R)		Three Ph UG - 240/4160 GY		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
Street Lights			MW Inactive, Inactive, No		Unknown, MPW		Three Ph UG - 277/480 Y		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Street Light		MW Inactive, Inactive, No		Aluminum, MPW		Three Ph UG - 240/4160 GY		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Street Light		MW Inactive, Inactive, No		Concrete, MPW		Three Ph UG - 277/480 Y		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Street Light		MW Inactive, Inactive, No		Fiberglass, MPW		Three Ph UG - 240/4160 GY		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Street Light		MW Inactive, Inactive, No		Fiberglass Concrete, MPW		Three Ph UG - 277/480 Y		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Street Light		MW Inactive, Inactive, No		Steel, MPW		Three Ph UG - 240/4160 GY		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Street Light		MW Inactive, Inactive, No		Unknown, Customer		Three Ph UG - 277/480 Y		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Street Light		MW Inactive, Inactive, No		Concrete, Customer		Three Ph UG - 240/4160 GY		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Street Light		MW Inactive, Inactive, No		Decorative Steel, Customer		Three Ph UG - 277/480 Y		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Street Light		MW Inactive, Inactive, No		Fiberglass, Customer		Three Ph UG - 240/4160 GY		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Street Light		MW Inactive, Inactive, No		Fiberglass Concrete, Customer		Three Ph UG - 277/480 Y		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Street Light		MW Inactive, Inactive, No		Steel, Customer		Three Ph UG - 240/4160 GY		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection
	Street Light		MW Inactive, Inactive, No		Poles		Three Ph UG - 277/480 Y		Security Light Conductor		Underground Disconnection		Underground Disconnection		Underground Disconnection

MP&W Water legend

Legend

Valve - No Def Query

- <all other values>
- Operational Area, Subtype, Customer Owned
- High, Hydrant/Valve, No
- Low, Hydrant/Valve, No
- High, Hydrant/Valve, Yes
- Low, Hydrant/Valve, Yes
- High, Line Stop, No
- Low, Line Stop, No
- High, Gate, No
- Low, Gate, No
- High, Gate, Yes
- Low, Gate, Yes
- High, Butterfly, No
- Low, Butterfly, No
- High, Butterfly, Yes
- Low, Butterfly, Yes
- High, Tapping, No
- Low, Tapping, No
- High, Tapping, Yes
- Low, Tapping, Yes
- High, Check, No

- Low, Check, No
- High, Check, Yes
- Low, Check, Yes
- High, Bypass, No
- Low, Bypass, No
- High, Gate - Double Disk, No
- Low, Gate - Double Disk, No
- High, Gate - Double Disk, Yes
- Low, Gate - Double Disk, Yes
- High, Gate - Resilient Wedge, No
- Low, Gate - Resilient Wedge, No
- High, Gate - Resilient Wedge, Yes
- Low, Gate - Resilient Wedge, Yes
- High, Lay Down, No
- Low, Lay Down, No
- High, Lay Down, Yes
- Low, Lay Down, Yes
- High, Left Hand Open, No
- Low, Left Hand Open, No
- High, Left Hand Open, Yes
- Low, Left Hand Open, Yes

- Pipe Insulation
- Casing

Fittings

- <all other values>
- subtype, Operational Area
- Sleeve, Low
- Sleeve, High
- Coupling, High
- Coupling, Low
- Saddle, High
- Saddle, Low
- Cross, High
- Cross, Low
- Reducer, High
- Reducer, Low
- Tee, High
- Tee, Low
- Cap, High
- Cap, Low
- Blow, High
- Blow, Low
- Bend, High
- Bend, Low
- Bell Clamp, High
- Bell Clamp, Low

Blow Off

Plants & Storage Structures, PRV

- <all other values>
- SUBTYPE
- Air
- Sediment
- Water Hyperlinks
- No Dig Zone
- Text
- Text Leader Line
- Water Net Junctions
- Piezometer
- Tracer Box
- Back Flow Preventer
- Manhole

Meters

- Water Meter
- Inactive Water Meter

Corporation Tap

- SUBTYPE, Operational Area
- Abandoned Tap, High
- Abandoned Tap, Low
- Corporation Tap, High
- Corporation Tap, Low
- Curo Stop

Services & Fire Lines

- <all other values>
- subtype
- Commercial Service
- Fire
- Residential Service

Meter Pits

- <all other values>

SUBTYPE

- Meter Pit

Main Breaks

- Operational Area
- High
- Low
- Wells

Plants & Storage Structures, PRV

- <all other values>
- Subtype
- Elevated Storage
- Ground Level Storage
- Pressure Reducing Station
- Pump Station
- Treatment Plant

Hydrant - With Labels

- <all other values>
- Operational Area, CUSTOMER OWNED
- High, N
- Low, N
- High, Y
- Low, Y

Mains

- <all other values>
- Subtype, OPERATIONAL AREA, CUSTOMER OWNED
- Chemical Injection, Low, N
- Distribution Main, High, No
- Transmission Main, High, No
- Hydrant Leg, High, No
- Distribution Main, Low, No
- Transmission Main, Low, No
- Hydrant Leg, Low, No
- Raw Water, Low, No
- Abandoned, High, No
- Abandoned, Low, No
- 12, Low, Y
- Transmission, Low, Y
- Distribution Main, Low, Yes
- Hydrant Leg, Low, Yes
- Distribution Main, High, Yes
- Hydrant Leg, High, Yes
- Tracer Wire

Operational Area

Valve Turning Zones

- <all other values>
- Operational Area
- High
- Low
- Zone
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10

Fittings

- <all other values>
- Subtype, Operational Area
- Sleeve, Low
- Sleeve, High
- Coupling, High
- Coupling, Low
- Saddle, High
- Saddle, Low
- Cross, High
- Cross, Low
- Reducer, High
- Reducer, Low
- Tee, High
- Tee, Low
- Cap, High
- Cap, Low
- Blow, High
- Blow, Low
- Bend, High
- Bend, Low
- Bell Clamp, High
- Bell Clamp, Low

Hydrant - With Labels

OPERATIONAL AREA, CUSTOMER OWNED

- <all other values>
- High, N
- Low, N
- High, Y
- Low, Y

Valve - With Labels

Operational Area, Subtype, Customer Owned

- <all other values>
- High, Hydrant/Valve, No
- Low, Hydrant/Valve, No
- High, Hydrant/Valve, Yes
- Low, Hydrant/Valve, Yes
- High, Line Stop, No
- Low, Line Stop, No
- High, Gate, No
- Low, Gate, No
- High, Gate, Yes
- Low, Gate, Yes
- High, Butterfly, No
- Low, Butterfly, No
- High, Butterfly, Yes
- Low, Butterfly, Yes
- High, Tapping, No
- Low, Tapping, No

OPERATIONAL AREA, CUSTOMER OWNED

- <all other values>
- High, Tapping, Yes
- Low, Tapping, Yes
- High, Check, No
- Low, Check, No
- High, Check, Yes
- Low, Check, Yes
- High, Bypass, No
- Low, Bypass, No

Operational Area, Subtype, Customer Owned

- <all other values>
- High, Gate - Double Disk, No
- Low, Gate - Double Disk, No
- High, Gate - Double Disk, Yes
- Low, Gate - Double Disk, Yes
- High, Gate - Resilient Wedge, No
- Low, Gate - Resilient Wedge, No
- High, Gate - Resilient Wedge, Yes
- Low, Gate - Resilient Wedge, Yes
- High, Lay Down, No
- Low, Lay Down, No
- High, Lay Down, Yes
- Low, Lay Down, Yes
- High, Left Hand Open, No
- Low, Left Hand Open, No
- High, Left Hand Open, Yes
- Low, Left Hand Open, Yes

Mains

- <all other values>
- Subtype, OPERATIONAL AREA, CUSTOMER OWNED
- Chemical Injection, Low, N
- Distribution Main, High, No
- Transmission Main, High, No
- Hydrant Leg, High, No
- Distribution Main, Low, No
- Transmission Main, Low, No
- Hydrant Leg, Low, No
- Raw Water, Low, No
- Abandoned, High, No
- Abandoned, Low, No
- 12, Low, Y
- Transmission, Low, Y
- Distribution Main, Low, Yes
- Hydrant Leg, Low, Yes
- Distribution Main, High, Yes
- Hydrant Leg, High, Yes

MP&W Communications – Fiber legend

Legend

- Service Areas
- All PONs
 - Termination
 - MPW Splice Closure
 - NewCom Splice Closure - To Be Built
 - NewCom Splice Closure - As Designed
 - Optical Splitter - To Be Built

Optical Splitter - As Designed

- <all other values>

Output Ports

- 32
- Fiber Riser

Restoration Coil

- <all other values>

Subtype Code

- Existing Storage
- Storage to be Installed

FiberNode

- Fiber_NetJunctions

MPW Fiber Cable

- <all other values>

OH/UG, MPVW_FiberType

- OH, Single Mode
- OH, Multi Mode
- UG, Single Mode
- UG, Multi Mode

NewCom Fiber - To Be Built

- <all other values>

OH/UG, MPVW_FiberType

- OH, Single Mode
- OH, Multi Mode
- UG, Single Mode
- UG, Multi Mode

NewCom Fiber - As Designed

OH/UG

- <Null>
- OH
- UG

Drop Cable - To be built

- <all other values>

OH/UG

- <Null>
- OH
- UG

Drop Cable - As Designed

- <all other values>

OH/UG

- OH
- UG
- Jumpers
- Demarc Box
- Multiple Dwelling Unit

Structure

Subtype Code

- FTTH - Other
- FTTH - Fiber Pot
- FTTH - SM - Drop Splice Closure
- FTTH - Med - 4 (2')
- FTTH - LG - Splitter Locations
- FTTH - XL - Fiber Storage
- Handhole
- Manhole
- Pedestal
- Flower Pot
- Storage Vault
- Route Node
- Strand
- ConduitNetwork_Junctions

Conduit

- <all other values>

Subtype Code

- Duct Bank
- Single Conduit
- Cable Tray
- Customer Owned
- FTTH New Duct
- FTTH New Single Conduit
- Trench

Support Structure

- <all other values>

Subtype CD

- Traffic Signal
- Distribution
- Security Light
- Street Light
- Transmission
- Customer Owned

Node Boundaries

Node	Node	Node
3QD8K1	6LB5C1	7KB5D1
3RD8G1	6LB5E1	7KB5A1
3SB8A1	6LB5D1	7K00F1
4LD8H1	6LC3G1	7K01H1
4SA3C1	6LD5K1	7K02K1
4VB7A1	6LD5F1	7K04G1
5HA3B1	6LD9J1	7K04H1
5JB5A1	6MB5A1	7K05F1
5JD9G1	6MB5D1	7K07F1
5JD9H1	6MB7A1	7K08F1
5KD9J1	6MC4H1	7K09H1
5LB5B1	6MD6H1	7LA0A1
5LB9A1	6NA2E1	7LA1A1
5LD9H1	6NA5B1	7LA1E1
5QD5H1	6NA6A1	7LA2C1
6HB7B1	6NB1C1	7LA2F1
6JA0A1	6NB3E1	7LA3A1
6JA3D1	7FD7K1	7LA3D1
6JB5C1	7GC2J1	7LA3E1
6JD9G1	7HD9G1	7LA3E2
6JD9K1	7JA1B1	7LB5B1
6KA3A1	7JA3B1	8GD6J1
6KB5D1	7JB5D1	8HA0C1
6KB8A1	7JB9C1	8HC1H1
6KB9B1	7JB9E1	8HD6H1
6K00F1	7JC1F1	8JB9E1
6K01F1	7JD1H1	8JC2J1
6K03F1	7JD7F1	8KA0B1
6K03K1	7JD7J1	8KA0C1
6K05G1	7JD9J1	8KA1D1
6KDBJ1	7KA2A1	8FA2D1
6LA3C1	7KA2E1	8FC1G1
	7KB5B1	

MP&W Communications – Hybrid Fiber Coax legend

Legend

Coax Global Network Amplifier	Coax Tap	· Coax Terminator	----- Distribution, P3-500
Coax Line Extender	· <all other values>	· Coax Riser	----- Distribution, P3-625
Coax Tap	SubtypeCode	· Coax Ground	----- Distribution, P3-750
· <all other values>	· Two Tap	· Coax Power Inserter	----- Distribution, P3-875
SubtypeCode	· Four Tap	· Coax Power Block	----- Distribution, QR-715
Two Tap	· Eight Tap	· Coax Power Supply	----- Distribution, RG-11UF
Four Tap	· Coax Directional Coupler	· Coax_Net_Junctions	----- Distribution, RG-11
Eight Tap	Coax Splitter	· Coax Splice	----- Express, P1-750
· Customer - Without Def Query	· <all other values>	Coaxial Cable	----- Express, P3-500
Coax Port	SubtypeCode	----- <all other values>	----- Express, P3-625
· <all other values>	· 2 Way Balanced	Description, CableType	----- Express, P3-750
SubtypeCode	· 3 Way Balanced	----- Distribution, P1-500	----- Express, P3-875
· Low	· 3 Way Unbalanced	----- Distribution, P1-750	----- Express, QR-715
· Mid	· Coax Inline Equalizer	----- Coaxial Cable - AS DESIGNED	----- Coax Jumper
· High	· Coax Global Network Amplifier		
· Coax Node	· Coax Line Extender		

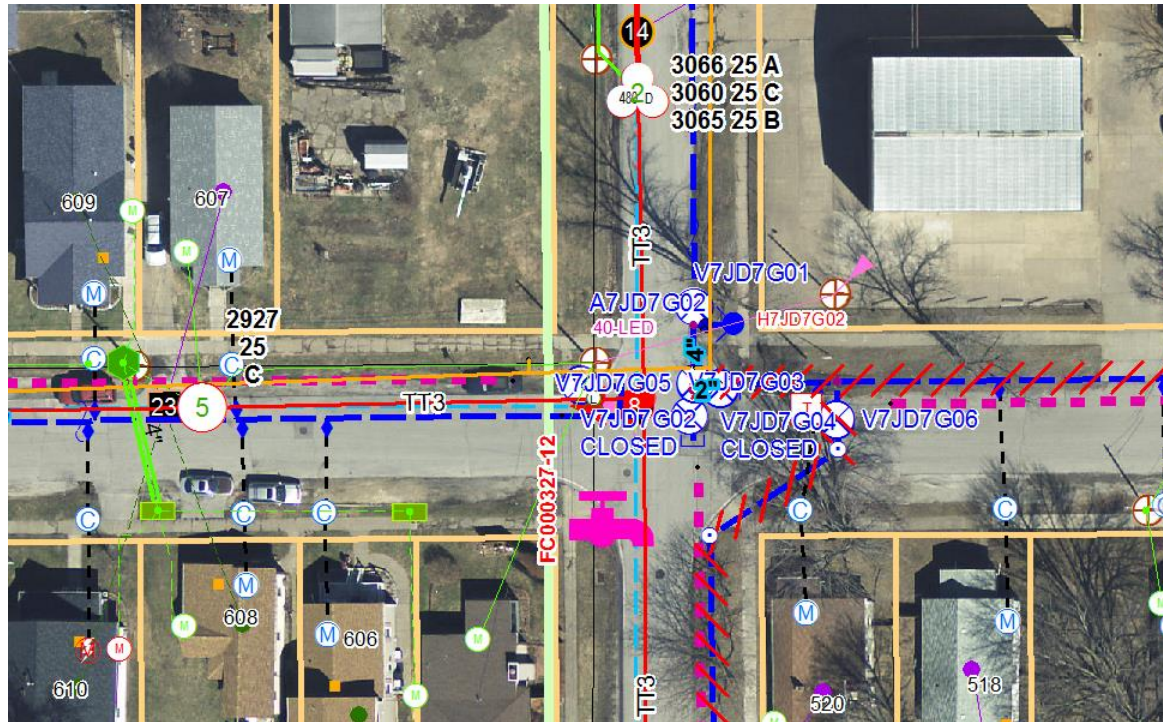
Symbol totals

- 206 Electric.
- 225 Water.
- 67 Fiber.
- 148 HFC.

Total = 646 Symbols.

Symbol totals...

With a multitude of symbols on a map at one time, it becomes difficult to make sense of all this information unless a majority of the information is conveyed through symbology.



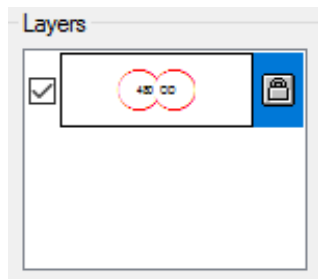
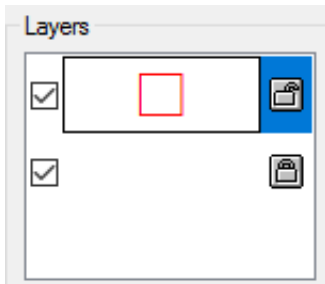
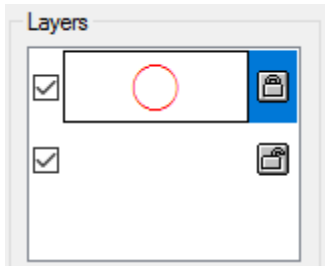
Working through transformers...

- Transformer Bank
 - ◆ <all other values>
 - Subtype, Secondary Voltage
 - Single Ph OH - 120
 - Single Ph OH - 120/240
 - 240 OD Two Ph OH - 240 OD
 - 480 OD Two Ph OH - 480 OD
 - 240 D Three Ph OH - 240 D
 - 120/208 Three Ph OH - 120/208 GY
 - 480 D Three Ph OH - 480 D
 - 277/480 Three Ph OH - 277/480 GY
 - 277/480 Three Ph OH - 277/480 Y
 - Single Ph UG - 120/240
 - ▲ Three Ph UG - 120/208 GY
 - ▲ Three Ph UG - 277/480 GY
 - ▲ Three Ph UG - 2400/4160 GY
 - ▲ Three Ph UG - 277/480 Y
 - ▲ Three Ph UG - 346/600 Y
 - ▲ Three Ph UG - 2400/4160 Y
 - ▲ Three Ph UG - 480 D
 - ▲ Three Ph UG - 2400 D
 - FT Foreign Owned - 120/240

- 2 - Single phase OH transformers.
- 2 – Two phase OH transformer banks.
- 5 – Three phase OH transformer banks.
- 1 – Single phase pad mounted transformer.
- 8 – Three phase pad mounted transformers.
- 1 – Foreign owned pad mounter transformer.

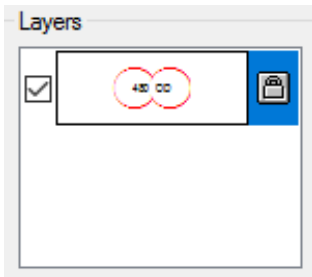
Each transformer is categorized by a subtype. This is MP&W's first step in breaking up the transformers for symbolization.

Working through transformers



- Single phase OH and UG transformers are simple to symbolize. Each symbol has only two layers. A **RED** circle or box representing the shape of the transformer and a **WHITE** layer below to mask out the aerial photos. Without the **WHITE** shape, the transformers are hard to see on the screen.
- The remaining transformers get more complex. As you can see the 2 – phase OH transformer only has one layer. It was originally constructed with 2 - **RED** rings, 2 - **WHITE** orbs, and 5 -**BLACK** text characters (9 layers).

Working through transformers



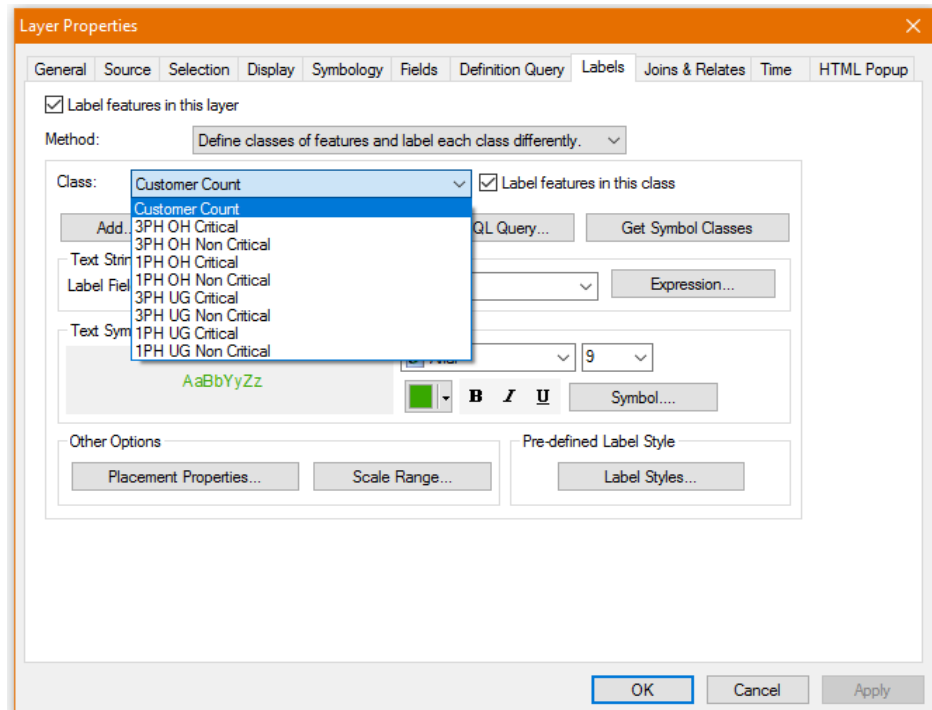
- If a symbol has more than 6 layers, it is more efficient in terms of computer resources to use a picture layer for the symbol.
- Therefore a multi layer symbol was created using a raster image. All characters layers were replaced with one picture symbol (.emf format).
- This procedure was used on all remaining polyphased transformers.

Working through transformers

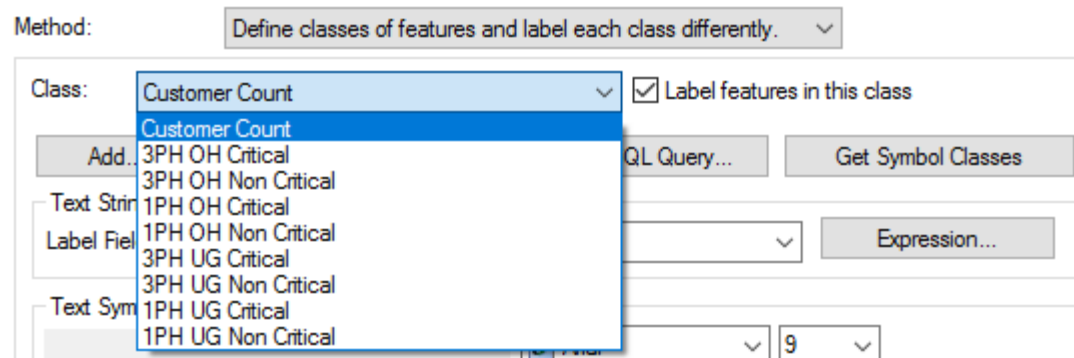
More Tools...

Labels:

- Labels are part of the information conveyance.
- Not all labels are created equal...



Working through transformers



- 9 label classes are determined by SQL queries and each class is labeled differently.
 - ❖ The first class is all transformers – a customer count labeled centered on top of the transformer symbol in **GREEN** text.
 - ❖ Then there are 8 queries that are similar, 4 are applied to OH and 4 queries are applied to UG transformers.
 - ❖ All of these labels are in **BLACK** text except the Critical Infrastructure labels which are **BLACK** with a **YELLOW** halo to make them stand out.

Working through transformers

In all, there are 19 transformer symbols:

- 1 universal label query.
- 2 OH single phase label queries.
- 2 UG single phase label queries.
- 2 OH polyphase label queries.
- 2 UG polyphase label queries.

This creates many possibilities in **clearly** conveying information to the intended audience.

What is an .emf file

EMF is a metafile format enhanced from an earlier version, that stores a set of function calls that are sent to the Windows Graphics Device Interface (GDI) to tell it how to display the symbol on screen. EMF files can contain either raster or vector components, or both. You can tell which components it contains by the way it looks when you scale it to a larger size—if it looks pixelated, then it contains raster components. Note that all the EMF files in the ArcGIS Pictures folder are raster graphics.

For EMF files, there is only one color that you can change—the background color. This means that for picture marker symbols that are used to symbolize points, you can set a background color that will fill a rectangular area behind the symbol.

Why an .emf file

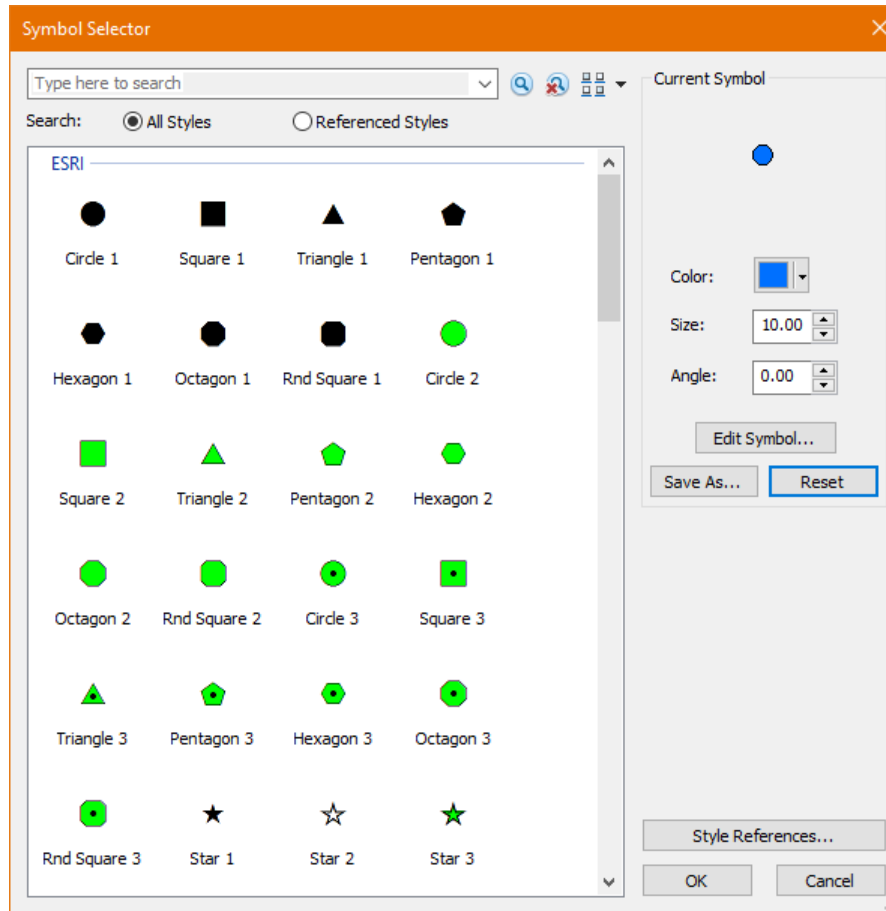
Complex images can be used as a single layer symbol, giving complex colors and images. For example, the following logos can be converted into an ArcMap symbol. The .emf file can have a transparent background if converted using software like Adobe Illustrator.



Next steps when adding new features

- Research for an industry symbol that can be adapted to your needs...
- Research through the ESRI fonts...
- Design symbol layer structure on paper...
- Creation in ArcMap...
- Adaptation...

Symbol Selector



This is where symbol creation starts...

Research - Electrical

- IEEE.
- APPA.
- RUS standards.
- <http://support.esri.com/download/854>.
- Other Municipal standards.
- General internet queries.

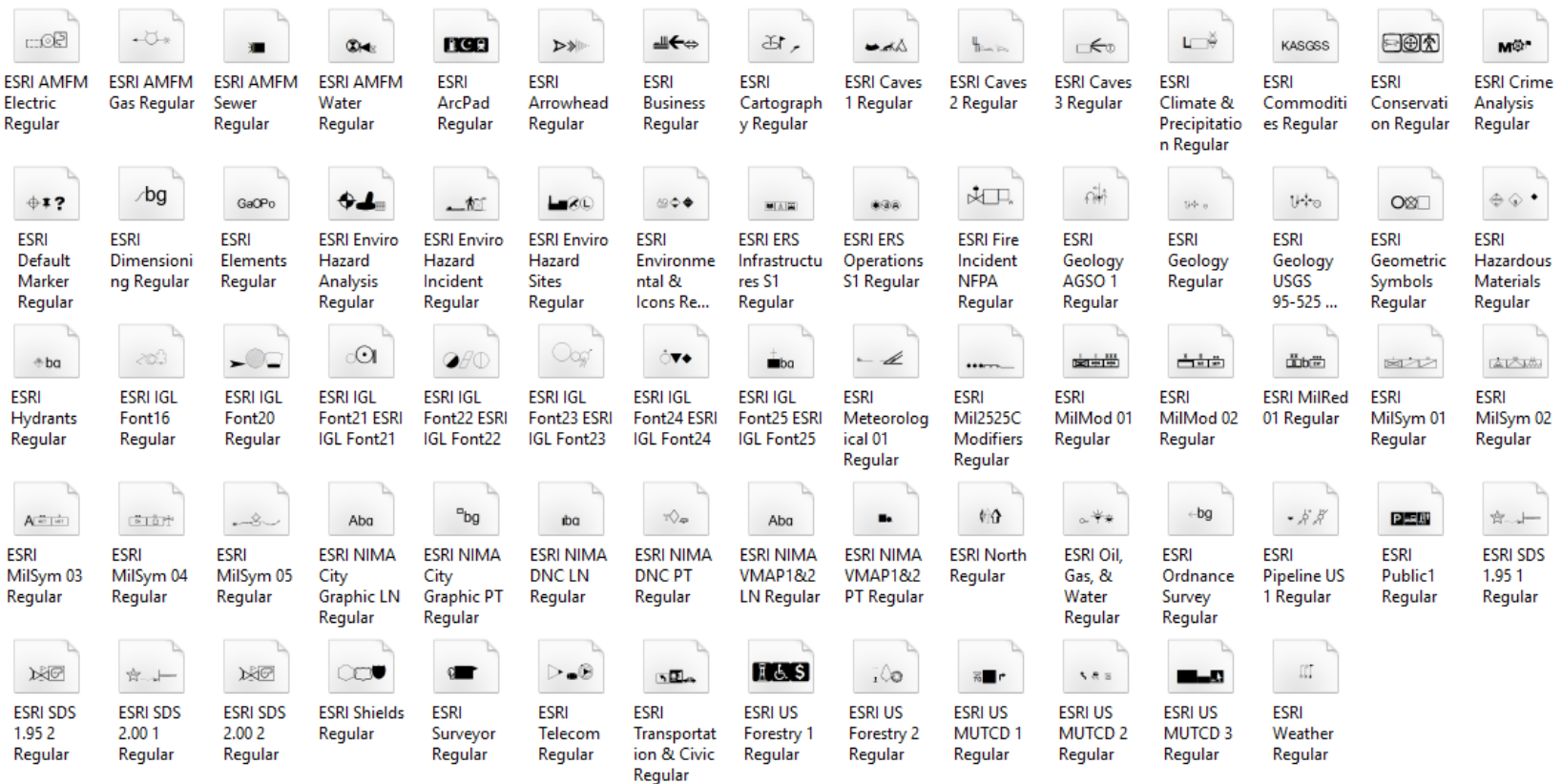
Research - Water

- AWWA.
- <http://support.esri.com/download/854>.
- Other Municipal standards.
- General internet queries.

Research - Communications

- Society of Cable Engineers (SCTE).
- RUS.
- <http://support.esri.com/download/854>.
- Other Municipal standards.
- General internet queries.

Research – ESRI symbols



There are over 70 ESRI character fonts that can be used to create symbology or layers within a symbol.

Research – Other true type fonts

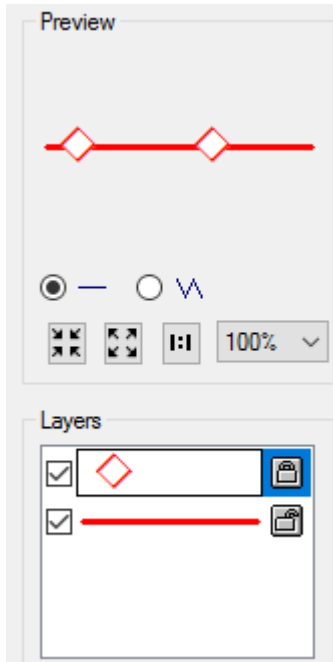
- Windows true type fonts:
 - ❖ Over 200 fonts available.
- Free true type fonts from the internet.
- Purchased true type fonts from many sources, including other graphic packages like – Adobe Illustrator.

Next... Linear features

Layering is not limited to point features. Line features can be layered as well.

Here is an example of MP&W's Hendrix cable. This is a bundled OH wire that is arranged in a diamond configuration.

This is a simple marker symbol on a simple line symbol.



Next... Linear features

Conduit...

The screenshot displays a software interface for configuring linear features. It is divided into several sections:

- Preview:** Shows two parallel red horizontal lines. Below them are icons for line styles: a solid line (selected), a dashed line, a dotted line, and a wavy line. There are also navigation icons and a zoom level set to 400%.
- Layers:** A list of two layers, each with a checked box and a red line icon.
- Properties:** A panel with a dropdown menu set to "Cartographic Line Symbol". Below it are tabs for "Cartographic Line", "Template", and "Line Properties". The "Line Properties" tab is active, showing an "Offset" field set to "-1.0000" and a "Line Decorations" section with radio buttons for "None", a left-pointing arrow, a right-pointing arrow, and a double-headed arrow. A "Properties..." button is at the bottom of the decorations section.

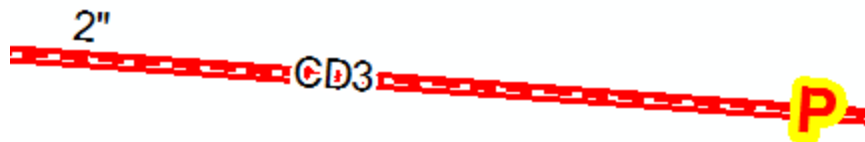
Next... Linear features

Another example is MP&W's conduit line symbol. It consist of 2 simple lines drawn on an offset to give the appearance of a tube. The electric line is drawn on top of the conduit to give this appearance...

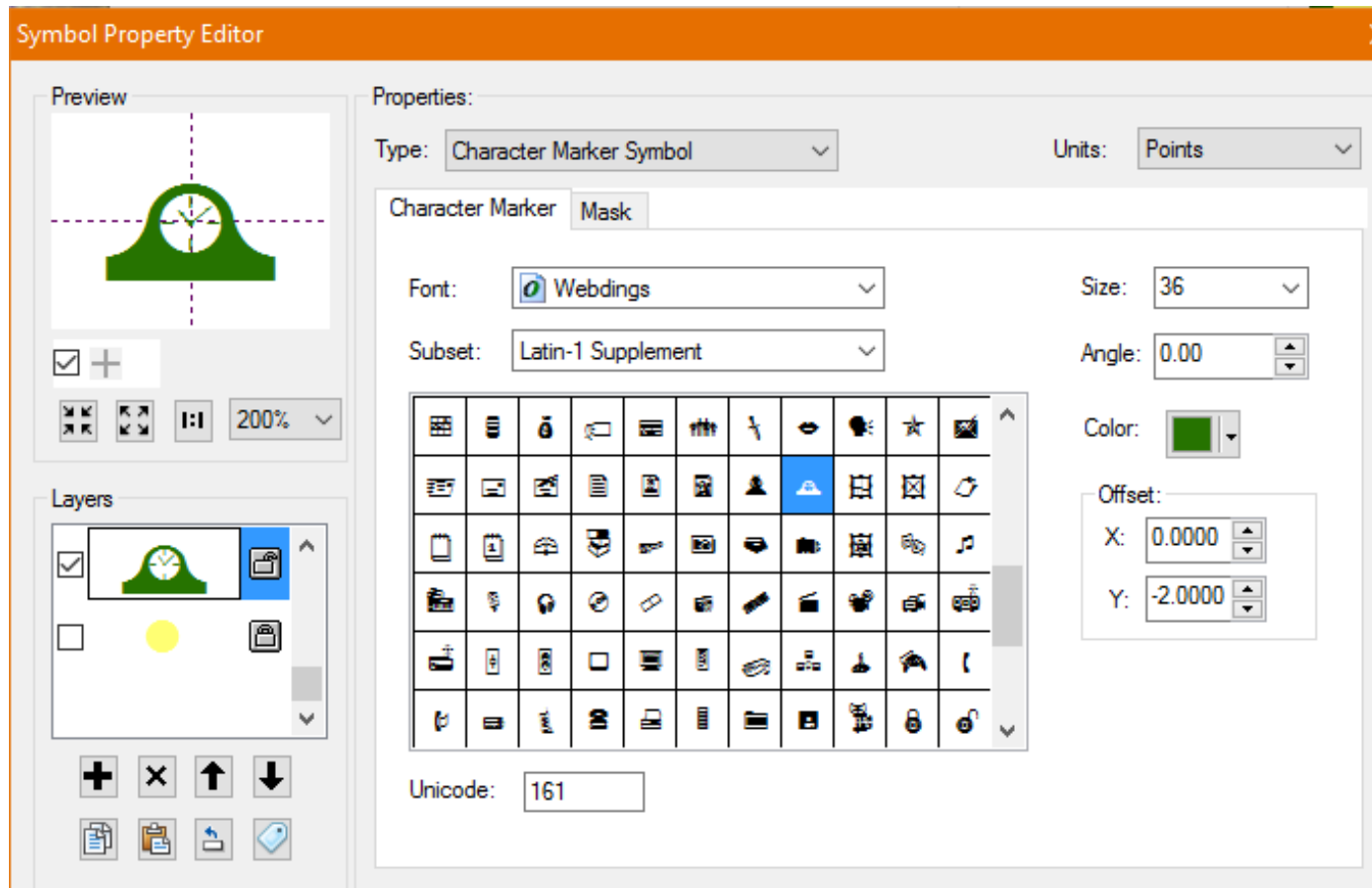
Conduit without Electrical cable...



Conduit with Electrical cable...

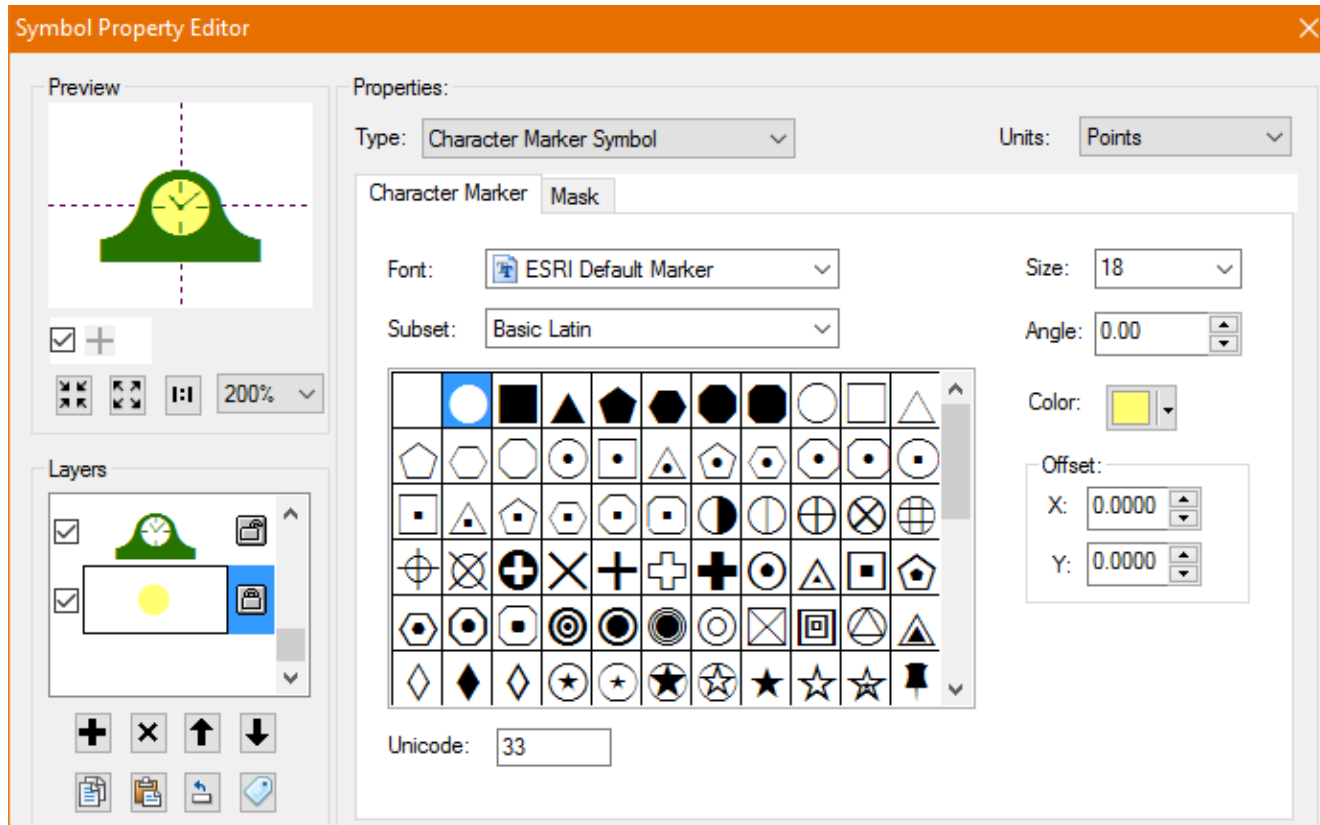


Lets build a symbol - TIMING



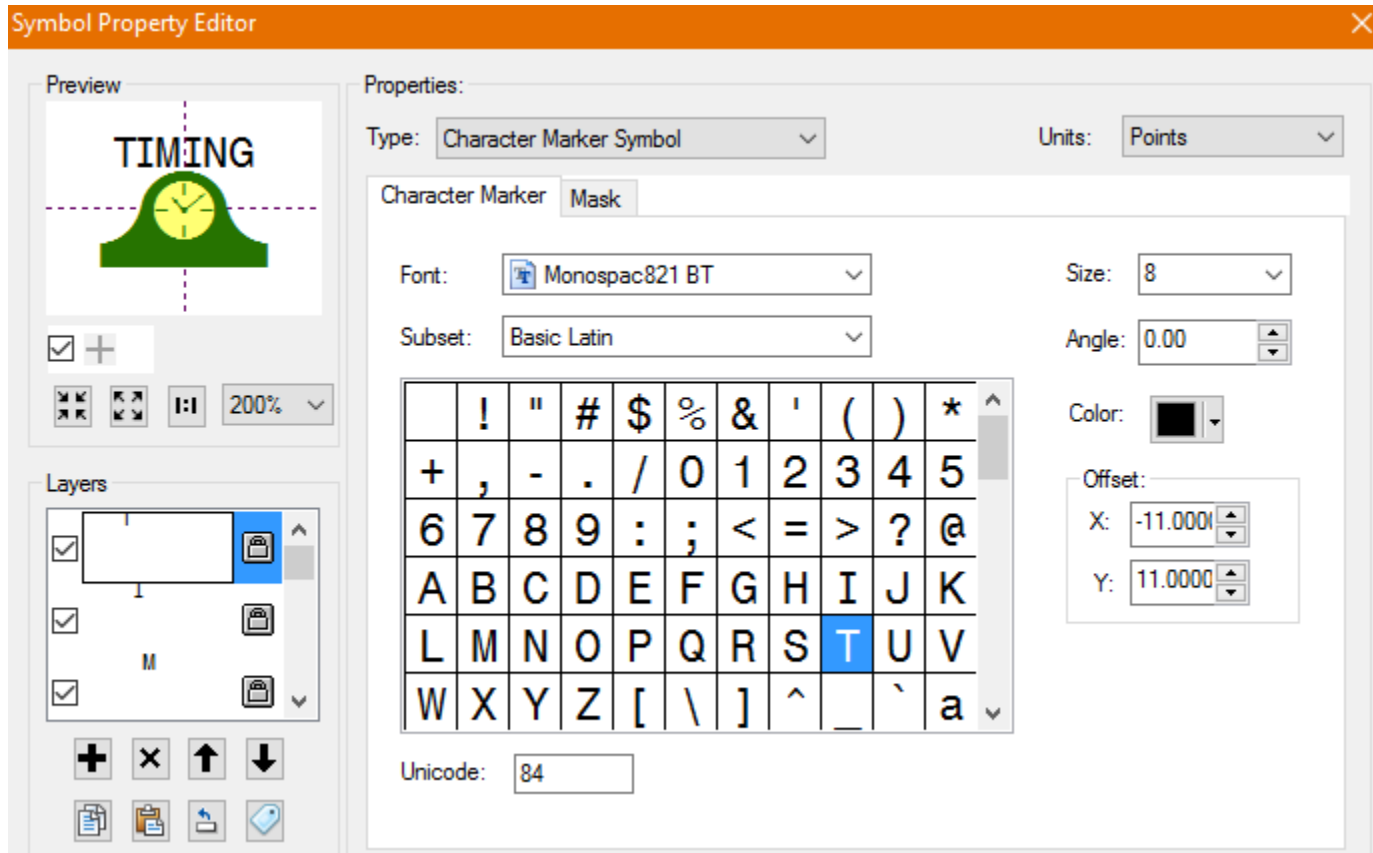
Start with the mantel clock – notice that the character was shifted on the Y coordinate to make the insert point at the center of the clock face.

Lets build a symbol -



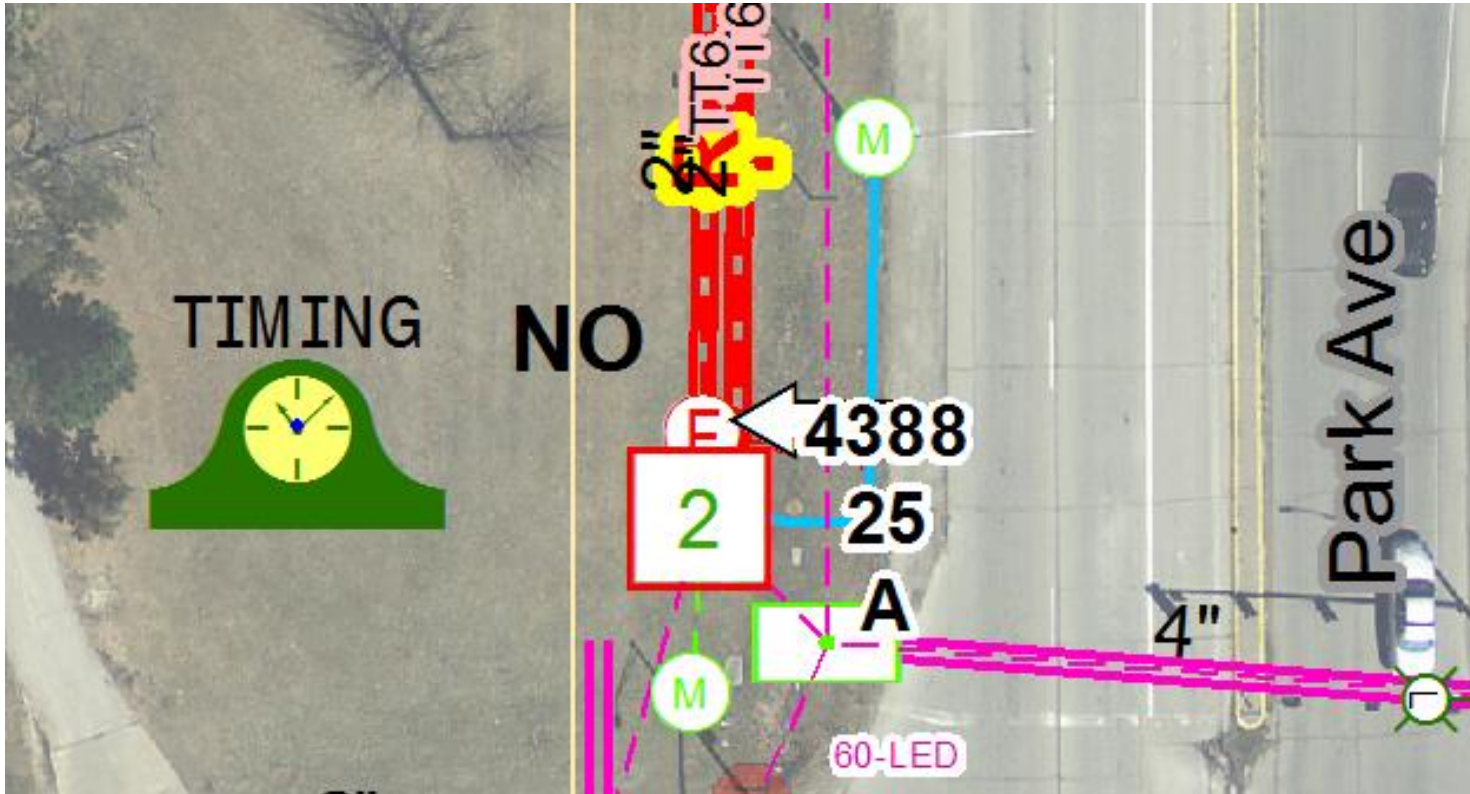
Next the yellow orb was added below the mantel clock to give a background to the clock face and mask out any GIS feature that would be underneath the completed symbol.

Lets build a symbol -



Finally adding the text characters T, I, M, I, N, G. Each was added as a layer. Horizontal shifting was used make the text readable.

Lets build a symbol -



This symbol represents a way to access the traffic controller's timing document, located in MP&W's document management system.

Thank You – Questions?



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