2017 PLS-CADD Advanced Training and User Group

Using the DON file Report

by
George Watson
CenterPoint Energy

New Feature in F1 menu
Multiple Project KML Export
(with DON File Report)

By: George Watson, Consulting Engineer

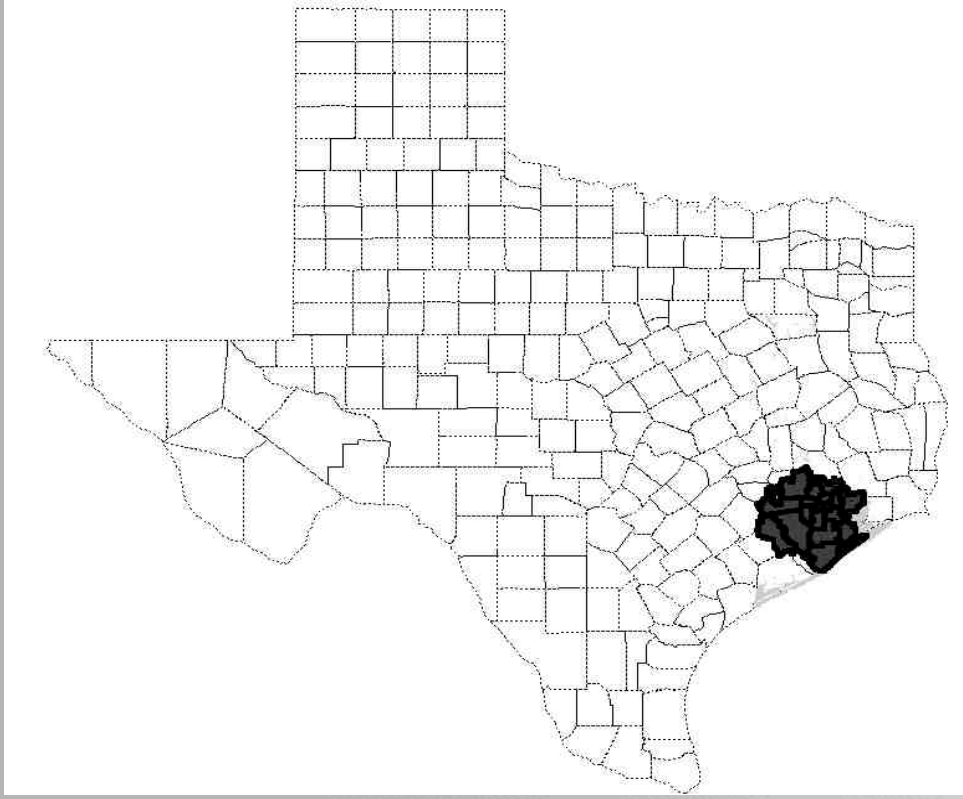
CenterPoint Energy

formerly Reliant Energy

formerly Houston Industries Inc.

formerly Houston Lighting & Power

Small Service Area (2.5% of Texas)
Big Electrical Load (25% of Texas)



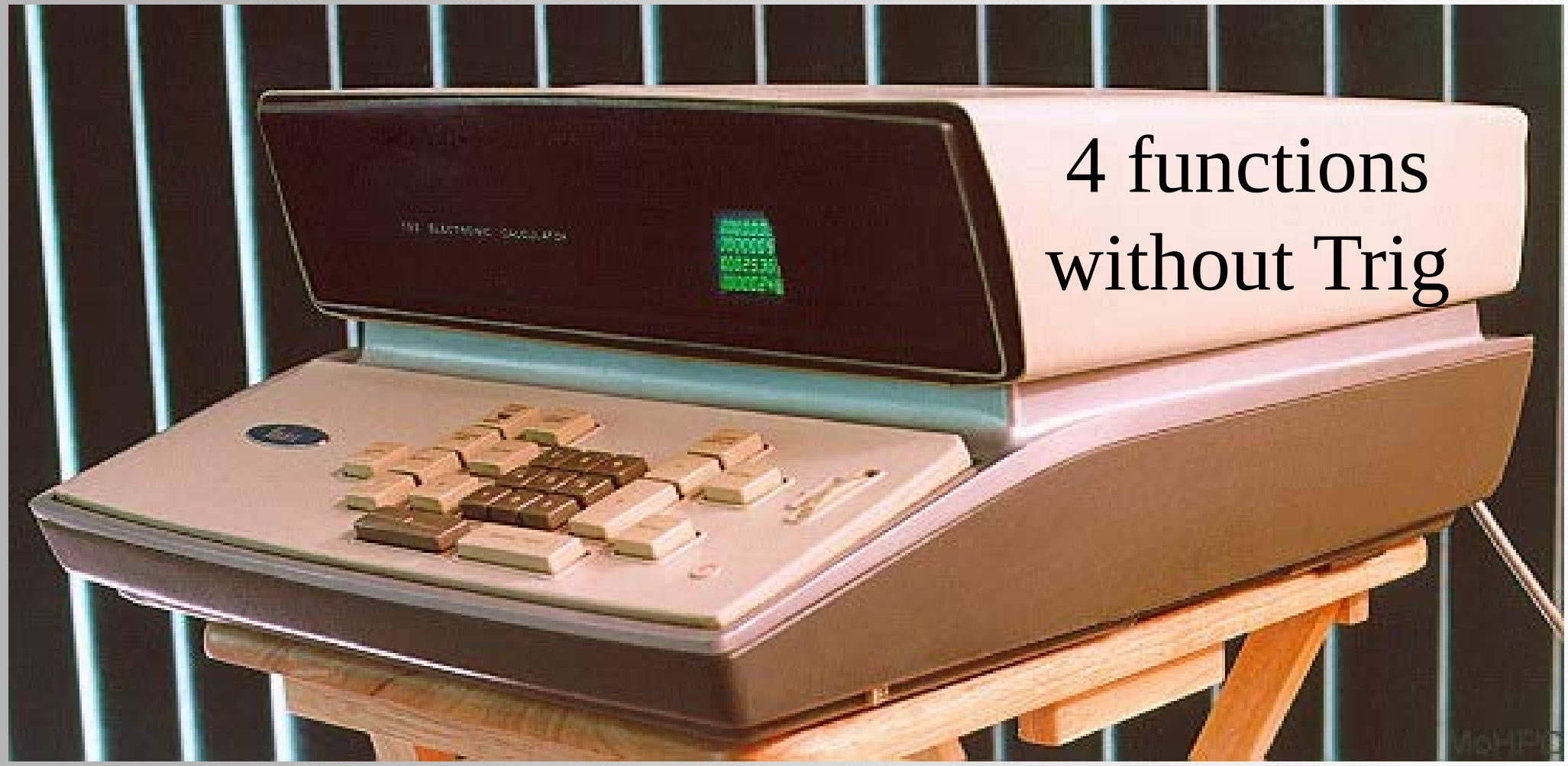
- Texas Peak Load for 2016 was 71,000mw
- CNP Peak Load for 2016 was 17,800mw
- (25% of Texas Total)

Typical Houston house

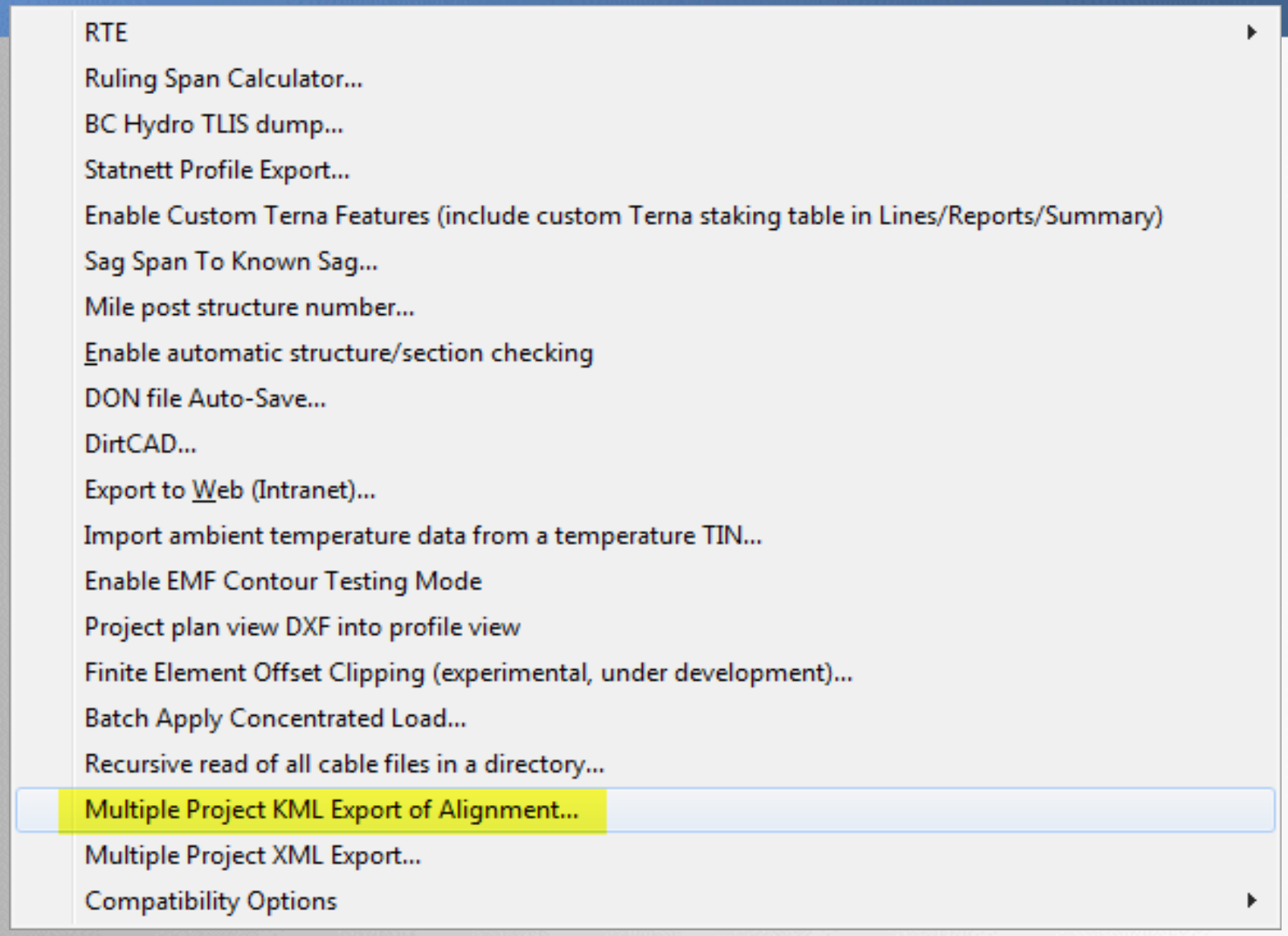
with 11 Car Garage

61,000 Square Feet on an 11 Acre Lot

Calculator from 1973 ($2,000)
2 months Engineer’s salary



New F1 Menu Item is Multiple Project KML Export



Why would you need this?

- 5300 DON Files in 1000 Folders on one Network Drive
- 700 DON Files in 360 Folders on another Network Drive
- 32 Current and Former Project Engineers with lines saved several places
- 2 Consulting Companies with many Engineers
- 40,000 Unique TOW and POL numbers in the System
- 28,000 TOW and POL models in Library of Structures
- 67,000 TOW and POL models in various Project Folders

- Where is the Latest Line Model??

Why would you need this?

- You need to analyze Structure 14632 for some reason
- You send out an eMail to all current Engineers.. And Wait
- You ask Chester who worked on the line last (every company has a Chester)
- You pull up the one you found from 5 years ago….
- Several hours or days of analysis work later….
- It was an old Line Model with the wrong conductor and different structures
- Repeat search to find the newest line model

- There is a way to make a Catalog of Structure Models

The DON Report Format

Customize "Multi Project Structure Report"

Customizations saved to file: c:\pls\pls-cadd.sma

(•) Simple Customizations (Show/Hide Columns)
( ) Advanced Customizations (Column order, Formatting, Translation...)

PLS title: Multi Project Structure Report

User title:

[x] Include in report [x] Include in XML export

	Column Name	Display in Report
1	DON File	Show
2	DON File Date	Show
3	Line Name	Show
4	Line Selected	Hide
5	Structure Number	Show
6	Station	Hide
7	X	Hide
8	Y	Hide
9	Ahead Span	Hide
10	Height Adjust	Hide
11	Offset Adjust	Hide
12	Orient Angle	Hide
13	Structure File Name	Show

The DON Report Available Fields

- DON file name (with path)
- DON File Save Date
- Line Name (for multiple lines in the XYZ)
- Line Selected
- Unique Structure Number
- Station
- X coordinate
- Y Coordinate
- Ahead Span
- Height Adjustment
- Offset
- Orientation
- Structure File Name (with path)

The DON Report format that I used

- DON file name (with path)
- DON File Save Date
- Line Name (for multiple lines in the XYZ)
- Unique Structure Number
- Structure File Name (with path)

Report Notes and Limitations

- The program will crawl through all PFL or XYZ line models in the folder you selected
- The report will **not** look inside BAK files to find unique structure numbers
- Unique structure numbers is the key to keeping track of your system of T-Lines
- If all your lines start with structure #1 and sequentially increase to the last tower, this report is not helpful

Steps to Generate the Report

- Open a small PFL or XYZ model (just so you can hit F1)
- Hit the F1 and select Multiple Project KML Export
- Select the root folder to start in from the drop down
- Select a Folder to contain the resulting KML files
- Select YES to Generate DON report

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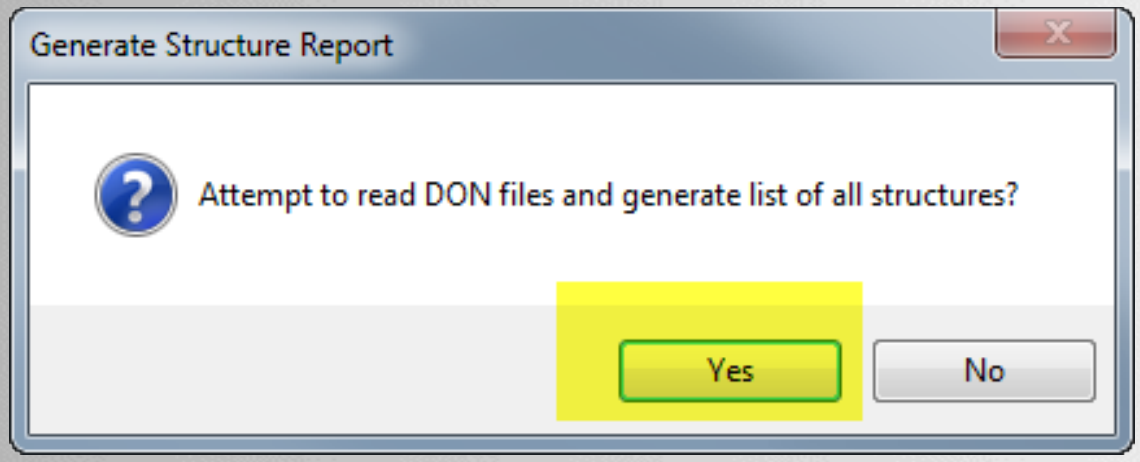


Steps to Generate the Report

- Right Click in DON Report
- Select Table View
- Copy all records to Clipboard
- Paste Table in Excel Spreadsheet
- Use separate Tab for each folder
- Set up a Master Spreadsheet and combine all Tabs into one big table
- Sort Table by Unique Structure Number

Update the Table

- Periodically run the DON report and add results to the folder tabs
- Use Excel's Find Duplicates to keep the new data and delete the duplicate old data
- Combine new results into Master Spreadsheet and Delete Duplicates
- Put a copy onto a shared folder and let users find structure numbers
- Create an Access Database with Custom Report and link to your GIS system

Questions about DON reports?

Automatic Base Plate Design for PLS-POLE using a custom Post-Processor program

You can have a copy if you want it, but it

WILL NOT BE SUPPORTED by PLS because

I wrote it for CNP to use

Assumptions

- Based on ASCE 48-11, Appendix VI
- 8 and 12 Sided regular polygon poles
- Baseplate will be designed for the moment capacity of the base section and not actual loads
- Many plates will be designed for different anchor bolt diameters and you pick the one you like from the group
- Two sets of outputs; One with bolt bending and One without bolt bending (gap < 2D)

Assumptions

- Anchor Bolts are equally spaced on the Bolt Circle diameter (not grouped in quadrants)
- Base Plate rests on leveling nuts with a gap between the Top of Concrete (TOC) and Bottom of Base Plate
- Center hole in Base Plate is small enough to allow effective bending planes on the plate at the pole shaft flats
- All Anchor Bolts on a single bolt circle diameter

Why Do I Need This?

- You could use PLS-Pole to design a pole shaft for your loading and arm geometry
- You might want a baseplate and anchor bolt designed for a preliminary pole cost estimate
- Your Pole Vendor does not have the time to do several “What-would-it-cost” designs for free with no pole order forthcoming
- You may not want to be bound to one Pole Vendor and you can design your own pole shafts and base plates

Disclaimer – I am NOT a programmer

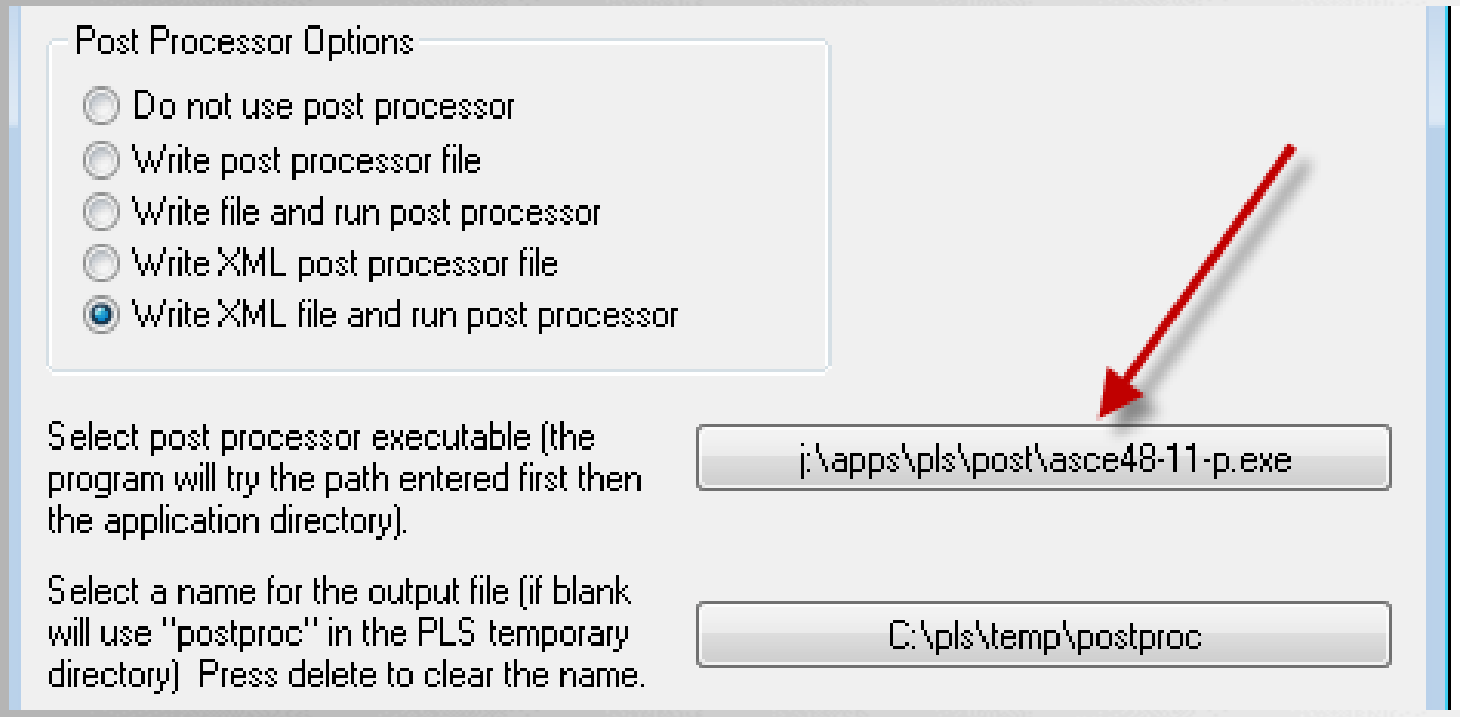
- I am a Structural Engineer and not a professional programmer. I enjoy writing programs to crunch the numbers. The inputs and outputs to the post processor program are very minimal.

Tools Used

- FORTRAN (because I wrote the main routine many years ago and I learned FORTRAN in 1968)
- XML parser done in FORTRAN (with much help from the Internet)
- XML output from PLS-Pole (file POSTPROC.XML must be in C:\PLS\Temp\

How do I use it?

- Run PLS-Pole as usual with the box checked to use the XML Post-Processor. Save the EXE and reference it in the dialog box.



How do I use it?

- After the Pole is analyzed, an UGLY dialog box will open where you input the number of Bolt Diameters to use for the Gap between the bottom of Base Plate and Top of Concrete
- A new Dialog box will open to ask what printer you want to use
- 20 or more pages will be sent to the printer you pick
- Pick an Adobe Printer-Driver if you want to save paper

How do I use it?

- The program will cycle through anchor bolts from 1” diameter to 3” diameter
- It assumes F1554-Grade 105 smooth bar bolts except for one 2.25” A615-Grade 75 rebar bolt
- A table on the last page will summarize the baseplates designed and tabulate the plate weights, number and sizes of anchor bolts

How do I use it?

- Pick a plate you like and input the parameters back into PLS-Pole. The parameters needed are on the individual pages of the output such as the angle to the bolts.
- Remove the check box for the Post-Processor because it will run every time you analyze this pole again and design the same set of base plates

Sample Output

SUMMARY OF BASE PLATES DESIGNED WITH BOLT BENDING CONSIDERED
Max Gap is 2.5 Bolt Diameters

NUM BLTS	DIAM	ALLOW	BOLT CIR	THICK	PLATE OD	PLATE ID	WEIGHT
40.	1.500	105.	69.50	3.250	73.500	58.000	1527.
32.	1.750	105.	70.50	3.250	75.000	57.000	1780.
24.	2.000	105.	71.00	3.250	76.000	56.500	1936.
24.	2.250	75.	72.00	3.500	77.500	56.000	2316.
16.	2.250	105.	72.00	4.000	77.500	56.000	2646.
16.	2.500	105.	72.50	4.250	79.000	55.000	3151.
12.	2.750	105.	73.50	3.500	80.500	54.500	2832.
12.	3.000	105.	74.00	3.500	81.500	54.000	3006.

SUMMARY OF BASE PLATES DESIGNED WITH BOLT BENDING NOT CONSIDERED
Max Gap is 2.0 Bolt Diameters

NUM BLTS	DIAM	ALLOW	BOLT CIR	THICK	PLATE OD	PLATE ID	WEIGHT
36.	1.500	105.	69.50	2.875	73.500	58.000	1351.
28.	1.750	105.	70.50	3.000	75.000	57.000	1643.
20.	2.000	105.	71.00	3.500	76.000	56.500	2084.
20.	2.250	75.	72.00	3.750	77.500	56.000	2481.
16.	2.250	105.	72.00	4.000	77.500	56.000	2646.
12.	2.500	105.	72.50	3.250	79.000	55.000	2409.
12.	2.750	105.	73.50	3.500	80.500	54.500	2832.
8.	3.000	105.	74.00	4.500	81.500	54.000	3865.

This design routine is based on the maximum possible
bending moment based on the pole shaft geometry.
It is up to the designer to choose one of the plate designs
and input the base plate values into PLS-POLE

Sample Output

```
 MAXIMUM GAP BETWEEN THE TOC AND BOTTOM OF BASEPLATE IS    4.5000 INCHES
 ANCHOR BOLT BENDING IS NOT INCLUDED IN THE UNITY CHECK

        MAX BOLT TENSION =    275.113 KIPS
        MAX BOLT COMPRESSION =  -282.355 KIPS



        TOTAL NUMBER OF BOLTS IS  20

   2.2500 INCH ANCHOR BOLT DIAMETER WITH     75.0 KSI YIELD STRESS ALLOWABLE
  18J REBAR BOLTS

        THE INITIAL ANGLE IS      9.0000 DEGREES
        THE ANGLE BETWEEN BOLTS IS    18.0000 DEGREES

        ANCHOR BOLT UNITY =       0.7785

             Bend DISTANCE ON BASE PLATE =    16.881 INCHES based on ASCE 48-11

             MAX PLATE MOMENT =    2290.6567 IN. KIPS

          3.7500 INCH PLATE THICKNESS from ASTM A350 LF6 CL2
             BASE PLATE MATERIAL STRENGTH =    60.0 KSI

             PLATE OD =          77.5000 INCHES
             PLATE ID =          56.0000 INCHES
             BASE PLATE WEIGHT =          2481.0 Pounds

           72.0000 BOLT CIRCLE WITH 11.2633 INCHES SPACING BETWEEN BOLTS
```

BOLT NUMBER	X COORD	Y COORD	LOAD	MOMENT ARM	ANGLE FROM X AXIS
1	35.557	5.632	40.325	4.0568	9.0000
2	32.076	16.344	124.308	4.4507	27.0000
3	25.456	25.456	195.768	3.2733	45.0000
4	16.344	32.076	247.710	4.4507	63.0000
5	5.632	35.557	275.051	4.0568	81.0000
6	-5.632	35.557	275.113	4.0568	99.0000
7	-16.344	32.076	247.890	4.4507	117.0000
8	-25.456	25.456	196.048	3.2733	135.0000
9	-32.076	16.344	124.661	4.4507	153.0000
10	-35.557	5.632	40.717	4.0568	171.0000
11	-35.557	-5.632	-47.568	4.0568	189.0000
12	-32.076	-16.344	-131.550	4.4507	207.0000
13	-25.456	-25.456	-203.011	3.2733	225.0000
14	-16.344	-32.076	-254.953	4.4507	243.0000
15	-5.632	-35.557	-282.293	4.0568	261.0000
16	5.632	-35.557	-282.355	4.0568	279.0000
17	16.344	-32.076	-255.133	4.4507	297.0000
18	25.456	-25.456	-203.291	3.2733	315.0000
19	32.076	-16.344	-131.904	4.4507	333.0000
20	35.557	-5.632	-47.959	4.0568	351.0000

Parting Thoughts

- The plate you pick may be thicker and heavier to allow construction an easier time when trying to stab the base onto fewer bigger anchor bolts
- Many smaller anchor bolts will produce the lightest base plate, but the total cost of bolts and plate will need to be considered along with ease of construction
- I’m old school and only use Kips and Inches
- Bring a thumb drive up at a break for a copy of the EXE

Questions about Baseplate Design?

Power Line Systems

IT'S ALL ABOUT YOUR POWER LINES

Advanced Sag & Tension
IEC
FAC 008/009
Materials Management
NESC
PLS-CADD ®
LiDAR Modeling
Structural Analysis
CSA
Distribution
Pole Analysis
CENELEC
Transmission
NERC Ratings
Line Optimization
Project Estimating

Thanks for your attention

FAC 003
ASCE
Joint Use
PLS-POLE
GO95
Vegetation Management
1000+ Users in 100+ Countries
Storm Hardening
IEEE
Line Ratings
TOWER
Drafting

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