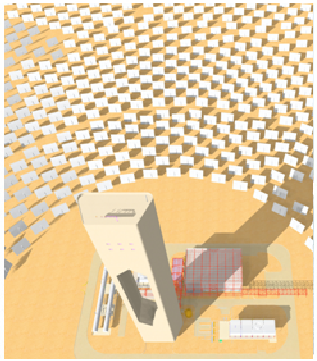
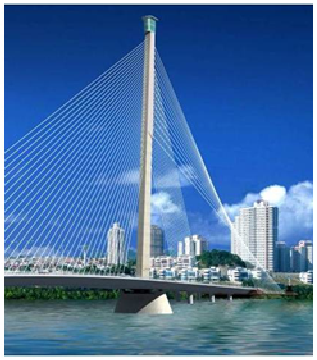








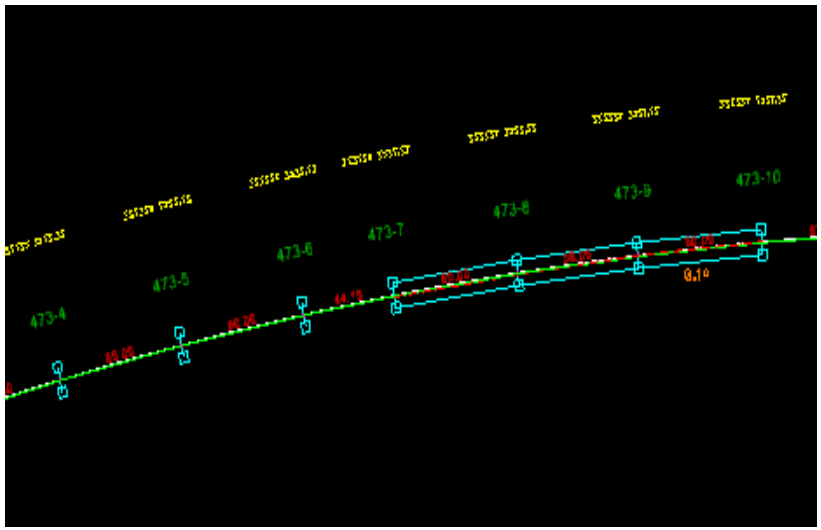




Power Rail Overhead Line (PROL)

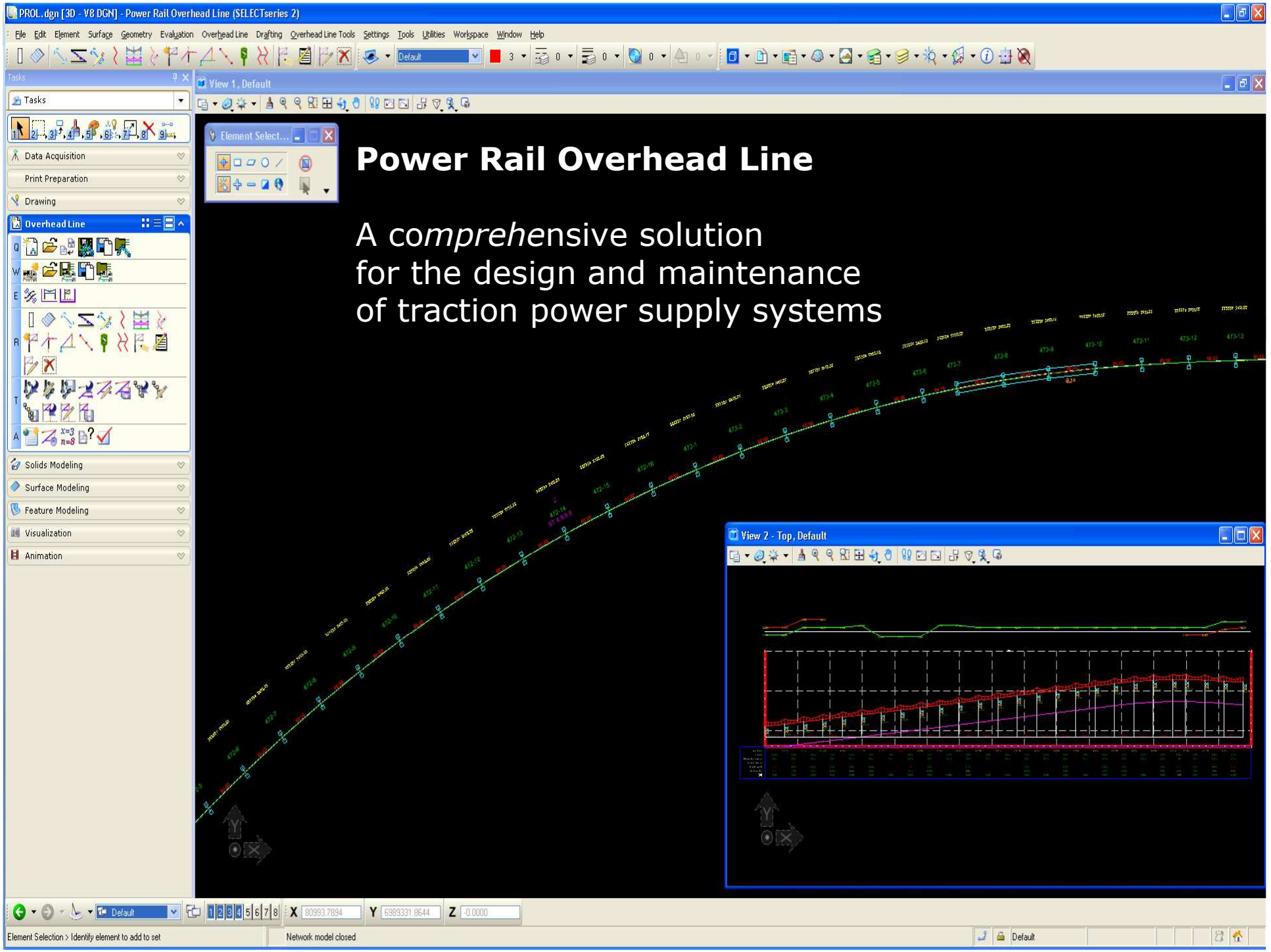
Håkan Norling
Bentley Professional Services

Bentley
Sustaining Infrastructure

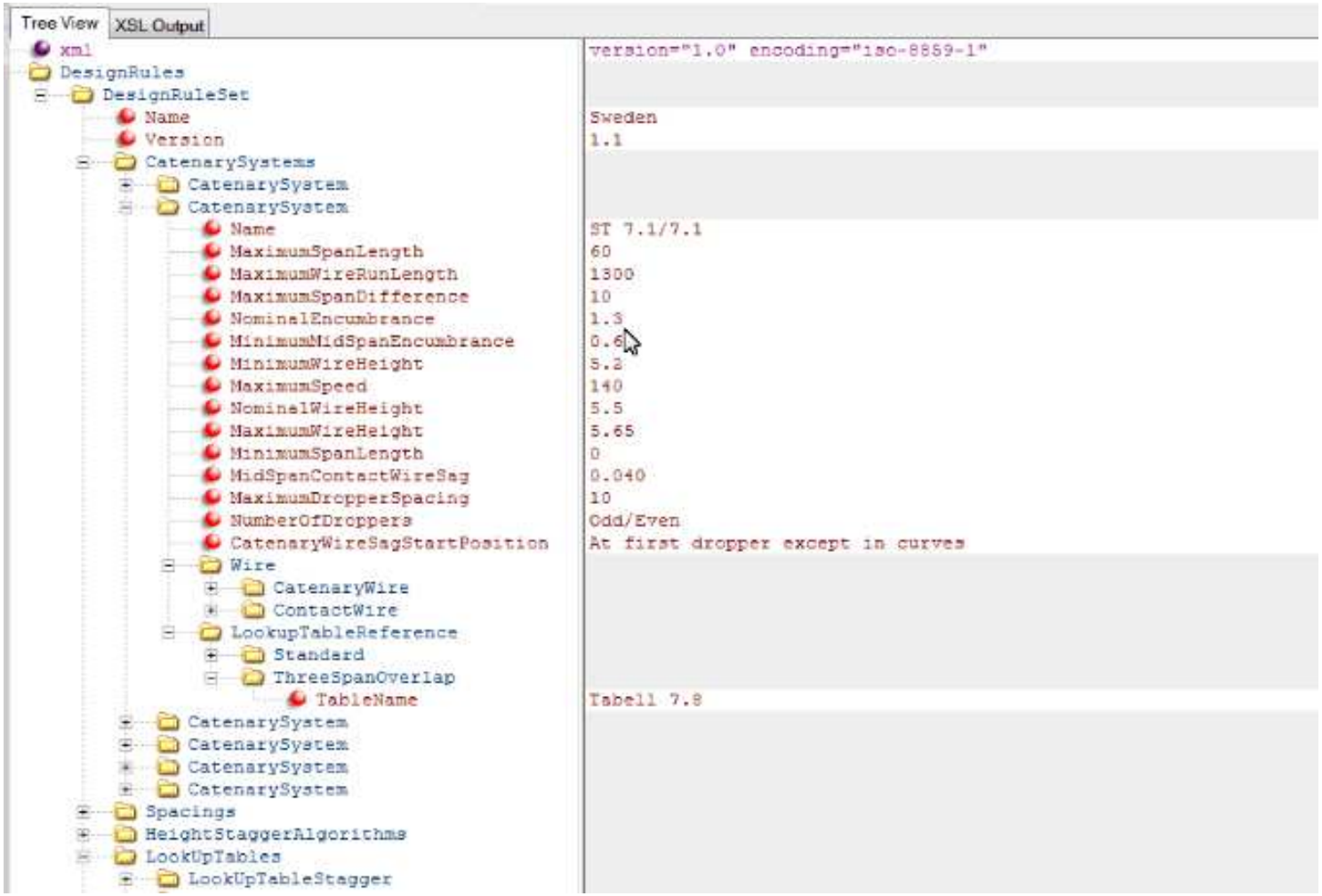
Agenda - PROL, 14th of November 2011



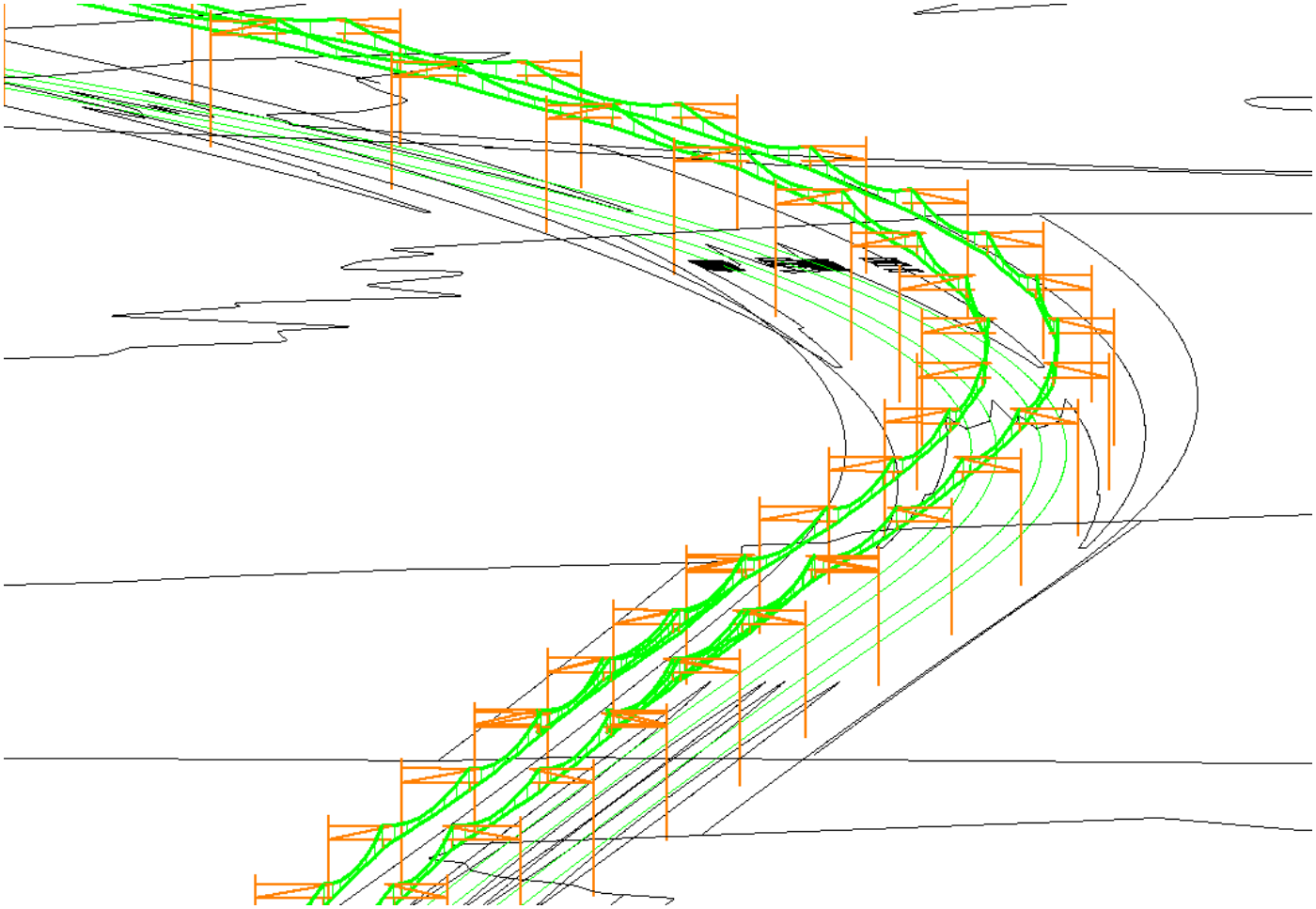
- Bentley's Power Rail Overhead Line solution
  - Overview of features
- Demo – Key features, PROL
  - Layout and design of catenary systems
  - Structures and reports
- Q&A


PROL.dgn [3D - V8 DGN] - Power Rail Overhead Line (SELECTseries 2)
File Edit Element Surface Geometry Evaluation Overhead Line Drafting Overhead Line Tools Settings Tools Utilities Workspace Window Help
Tasks
Data Acquisition
Print Preparation
Drawing
Overhead Line
Solids Modeling
Surface Modeling
Feature Modeling
Visualization
Animation
View 1, Default
Element Select...
Power Rail Overhead Line
A comprehensive solution
for the design and maintenance
of traction power supply systems
View 2 - Top, Default
Element Selection > Identify element to add to set
Network model closed

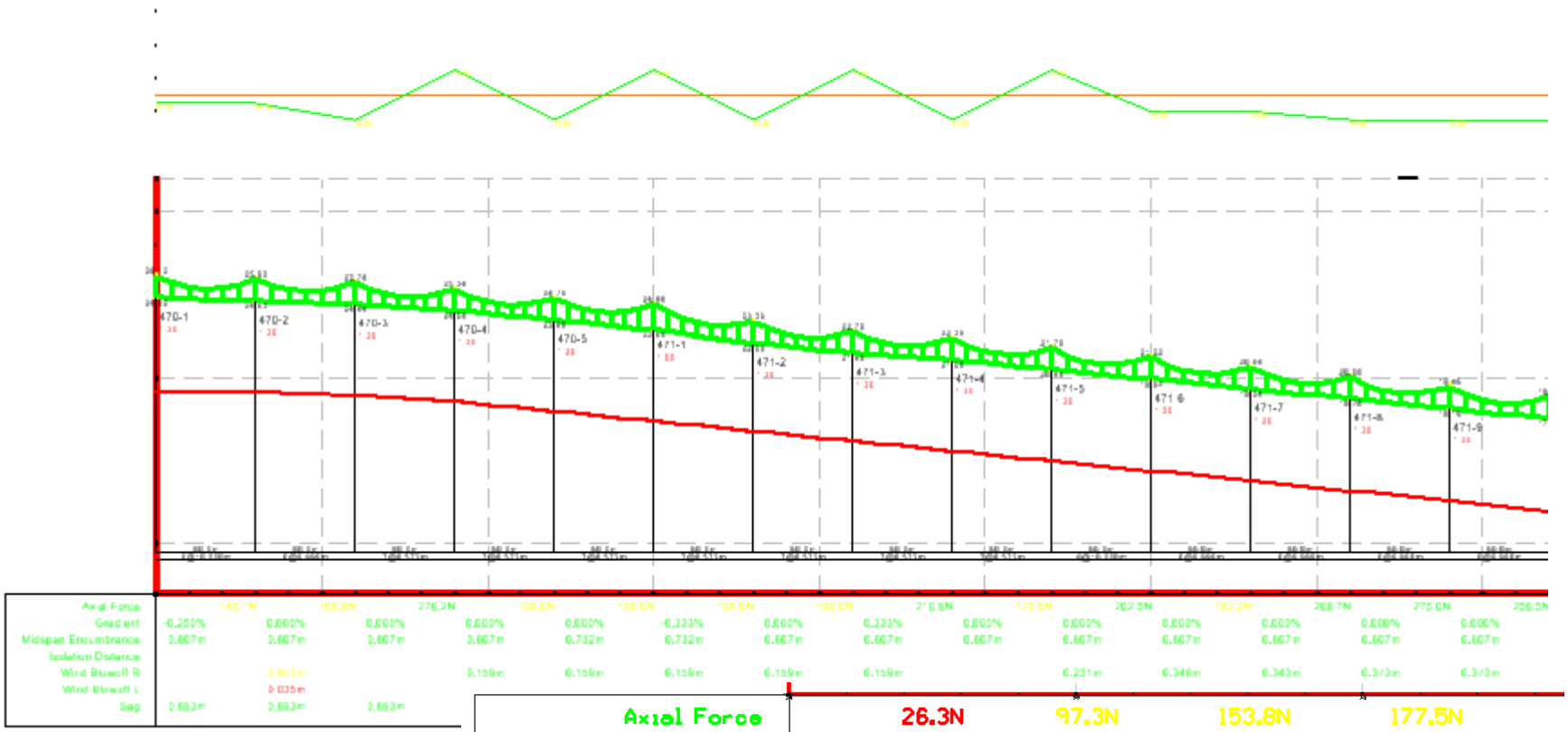
It’s Configurable – built-in design rules



It’s Dynamic



It’s adaptable

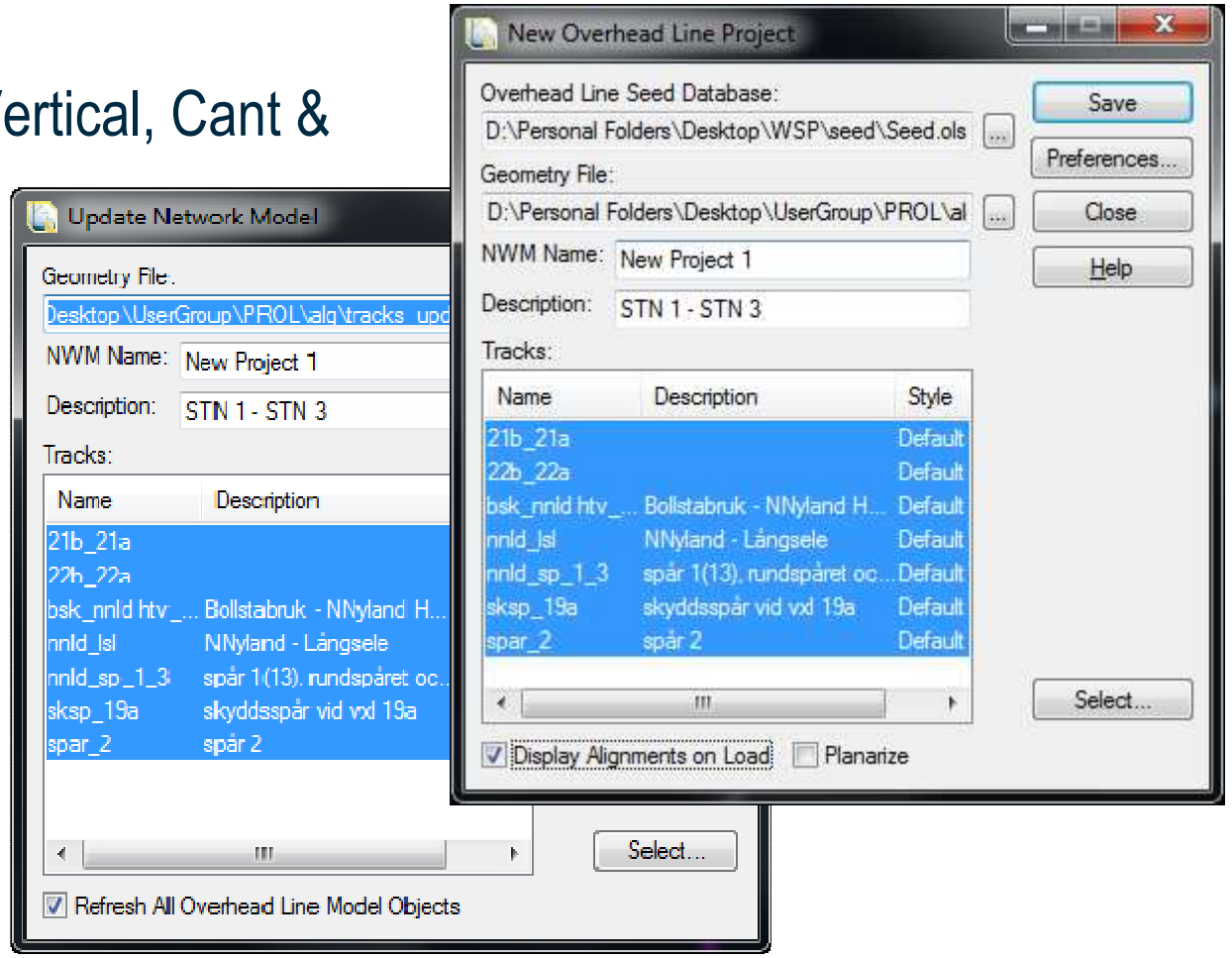


Axial Force		26.3N	97.3N	153.8N	177.5N
Gradient	-0.250%	0.000%	0.000%	0.000%	0.000%
Midspan Encumbrance	0.343m	0.525m	0.343m	0.343m	0.343m
Isolation Distance					
Wind Blowoff R		-0.155m	0.124m		0.207m
Wind Blowoff L		-0.245m	-0.124m		-0.207m
Sag	0.957m	0.775m	0.957m	0.957m	0.957m

Bentley
Sustaining Infrastructure

Network Model

- A network model is created from **Bentley Rail Track** geometry
  - Horizontal, Vertical, Cant & Turnouts
- Update ALG
  - Updates OLE objects according to the updated ALG

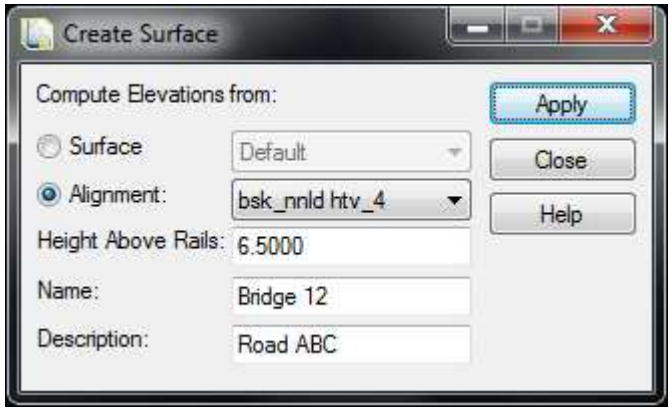


Zones

- A *zone* is an area where you can not place overhead line structures
  - A road crossing
  - A utility crossing
  - Other objects that you need to avoid

Surfaces

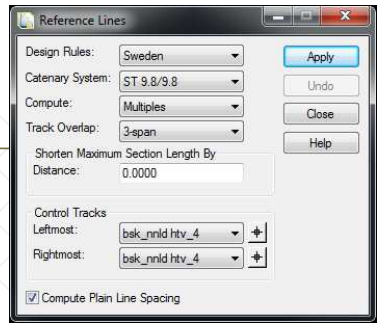
- A *surface* is an obstruction, like a bridge above the track, where a wire run may need to be lowered to provide clearance between the wire and the structure.



Overlaps & Reference Lines

- Overlaps are where wire runs go in and out of service, one wire ends and a new wire starts
- Reference lines are working lines upon which structures will be placed
  - Placement is based upon design rules for a specific catenary system
    - Look up tables
    - User defined algorithms
  - Placement may need to be adjusted to avoid obstructions
  - Placement is interactive

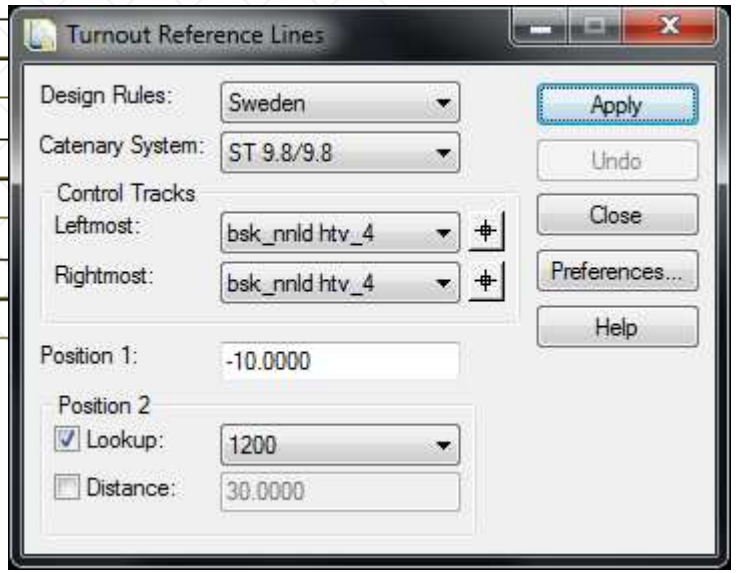
Table	Radius	B1	B2	b1	b3	b4	b5
Tabell 7.7	INF	-0.3	0.3	-0.3	-0.1	0.1	0.3
Tabell 7.7	20000	-0.3	0.3	-0.3	-0.1	0.1	0.3
Tabell 7.7	10000	-0.3	0.3	-0.3	-0.2	0.1	0.2
Tabell 7.7	9000	-0.3	0.3	-0.3	-0.2	0.1	0.2
Tabell 7.7	8000	-0.3	0.3	-0.3	-0.2	0.1	0.2



Turnout Reference Lines

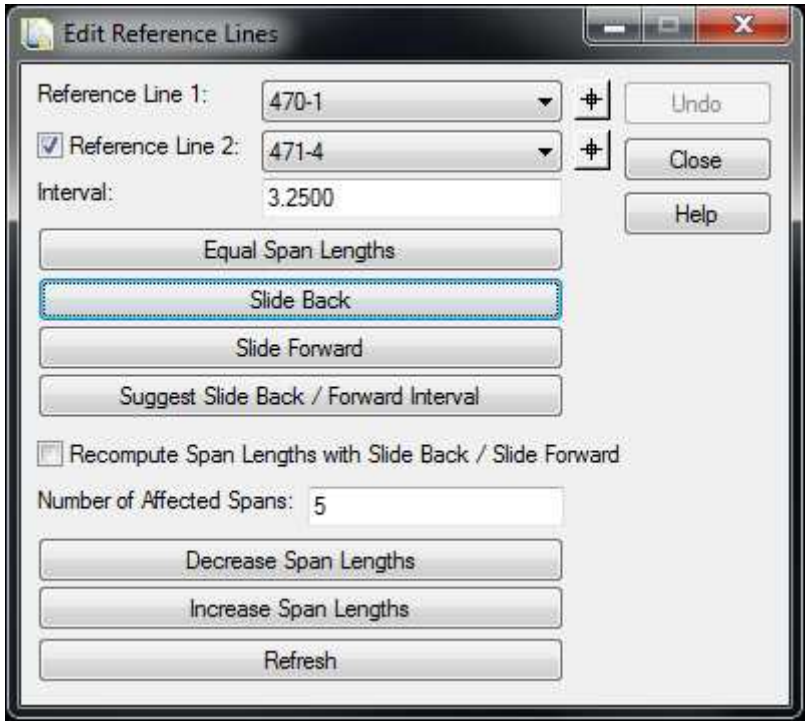
- Place reference lines relative to a turnout
  - Uses look tables related to the turnout's style
  - User define lengths

TurnOut			
	Name	***Position***	***OffsetToPosition***
	UIC 60 - 760 1:15	800	34.87
TurnOut			
	Name	***Position***	
	UIC 60 - 760 1:15	900	
TurnOut			
	Name	***Position***	
	UIC 60 - 760 1:15	1000	
TurnOut			
	Name	***Position***	
	UIC 60 - 760 1:15	1100	



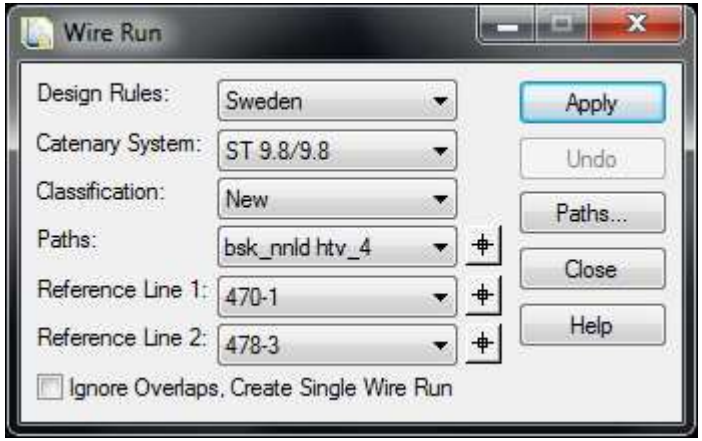
Reference Line Editing

- Adjustment of reference lines
  - Normally by small amounts
  - Adjusting span lengths
  - Updates entire model
    - Reference lines
    - Overlaps
    - Wire Runs
    - Span Bonding
    - Structures
    - Other wires
      - And all annotation



Wire Runs

- Wire runs consist of
  - Contact wire
  - Carrier wire
  - Droppers
- Utilizes design rules

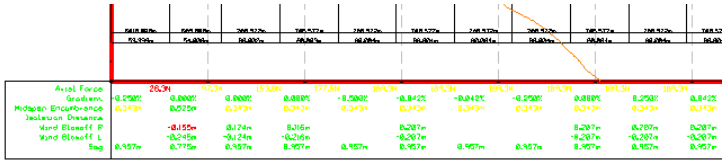


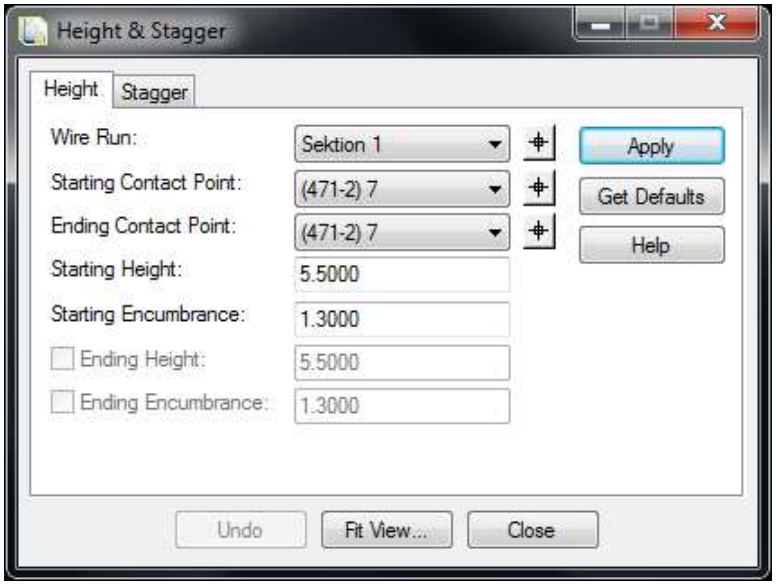
Design Rule Set: Sweden
Version: 1.1

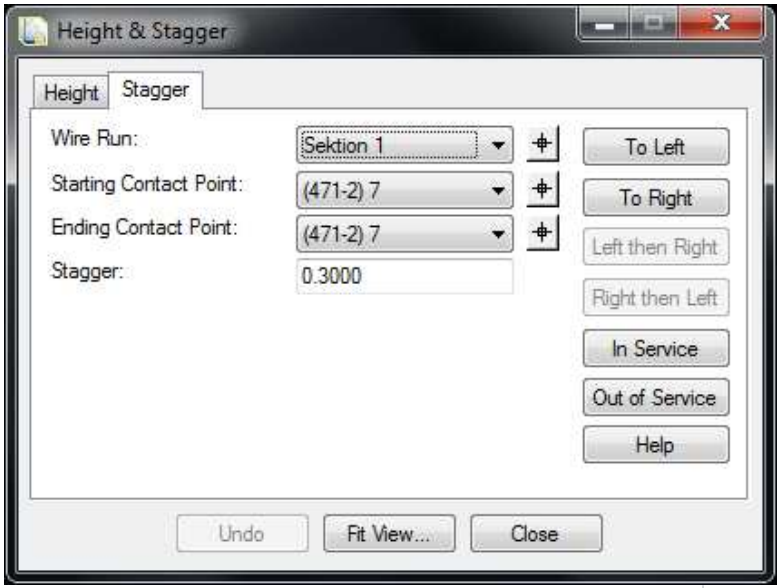
Name	Maximum Span Length	Maximum Wire Run Length	Maximum Span Difference	Nominal Encumbrance	Minimum Mid Span Encumbrance	Minimum Wire Height	Maximum Speed	Nominal Wire Height	Maximum Wire Height	Minimum Span Length	Mid Span Contact Wire Sag	Maximum Dropper Spacing	Distance To First Dropper	Number Of Droppers	Catenary Wire Sag Start Position
S 4.9/5.9	60	1300	10	1.3	0.6	5.2	120	5.5	5.65	0	0.080	8	8	Odd/Even	At Cantilever
ST 7.1/7.1	60	1300	10	1.3	0.6	5.2	140	5.5	5.65	0	0.040	10		Odd/Even	At first dropper except in curves
ST 9.8/9.8	60	1300	10	1.3	0.6	5.2	180	5.5	5.65	0	0.030	10		Odd/Even	At first dropper except in curves
ST 9.8/11.8	60	1300	10	1.3	0.6	5.2	200	5.5	5.65	0	0.030	10		Odd/Even	At first dropper except in curves
ST 15.0/15.0	65	1600	10	1.55	0.6	5.2	250	5.5	5.65	0	0.030	7	6	Odd	At first dropper
SYT 15.0/15.0	65	1200	10	1.8	0.6	5.2	250	5.5	5.65	0	0	10	5	Odd	At first dropper

Height & Stagger

- *Height* will adjust the vertical position of the wires
  - Incl. a gradient algorithm (under development)
- *Stagger* will adjust the horizontal position of wires
  - Incl. design checking
  - …. per Wire Run

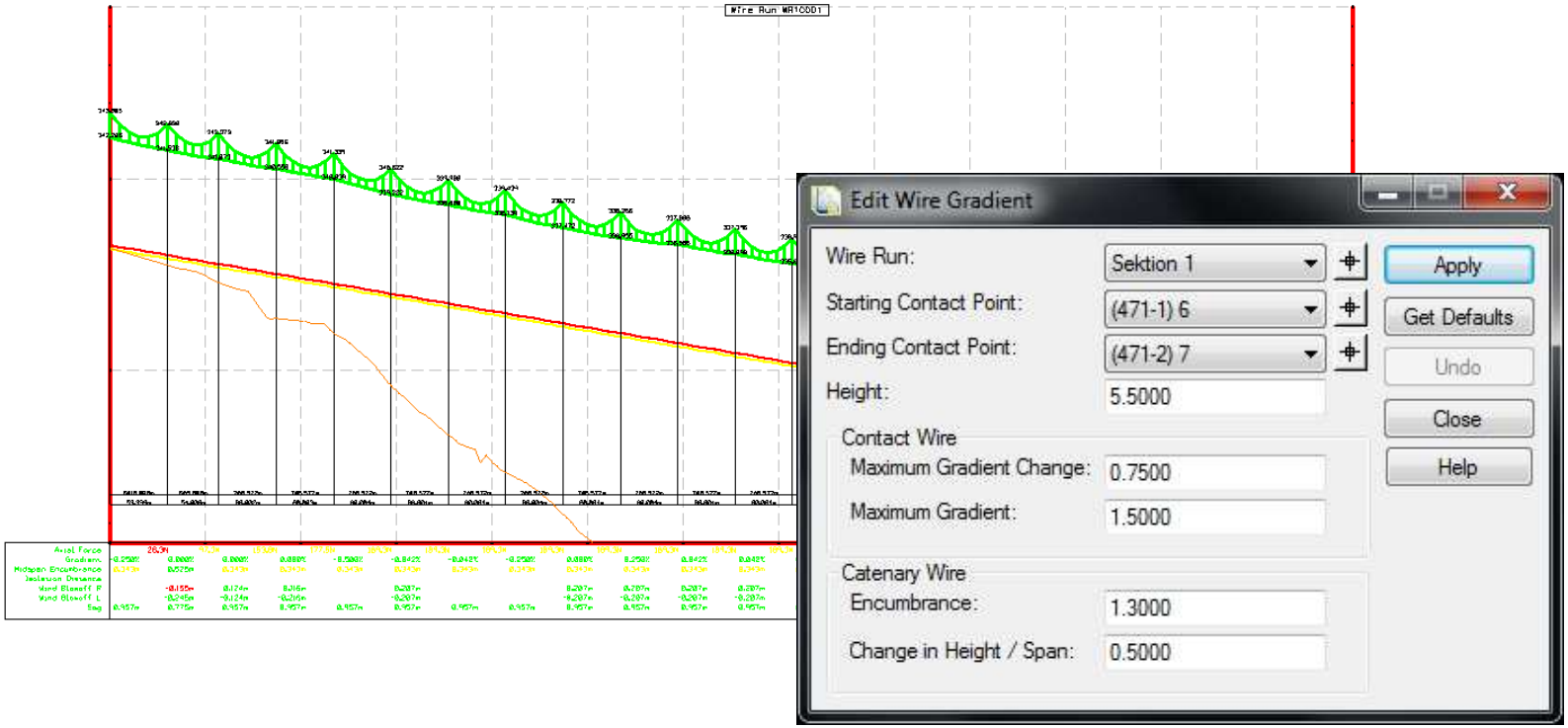






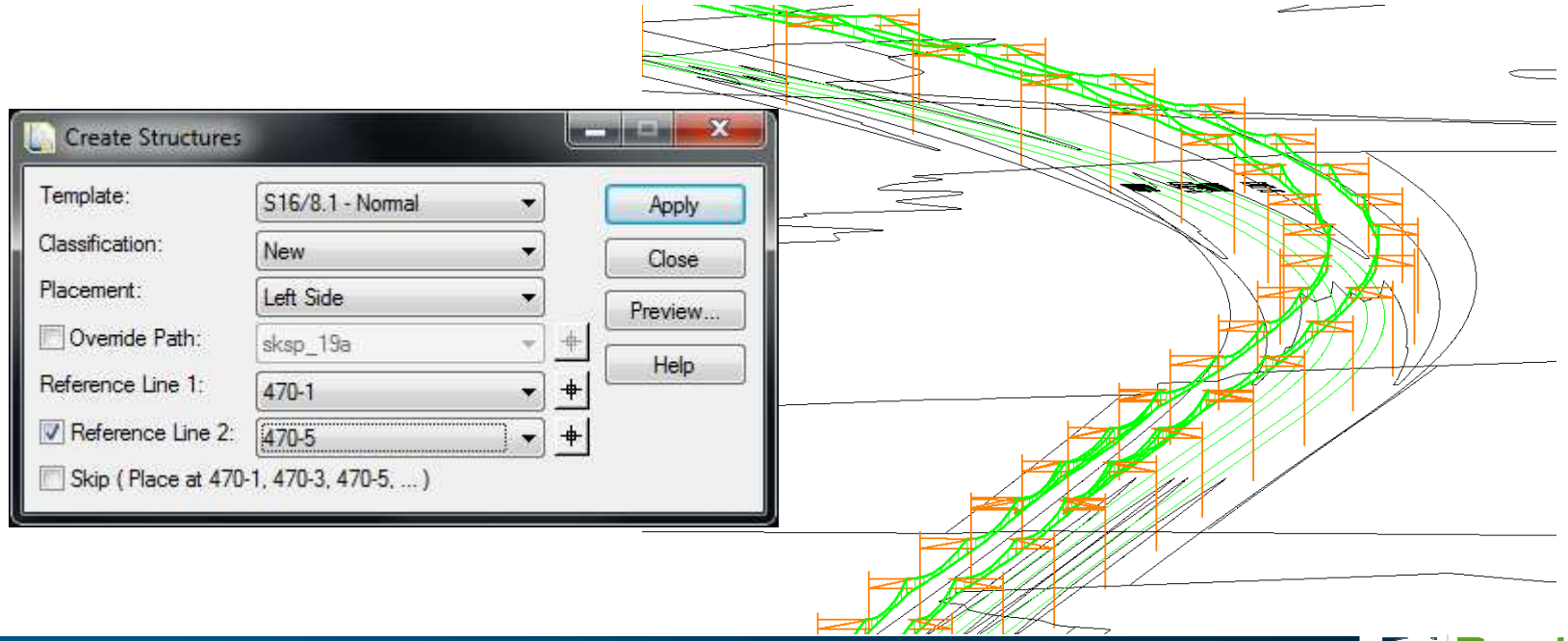
Wire Gradient

- Used to transition the wire height from the normal height to a height exception, for example, transitioning under a bridge



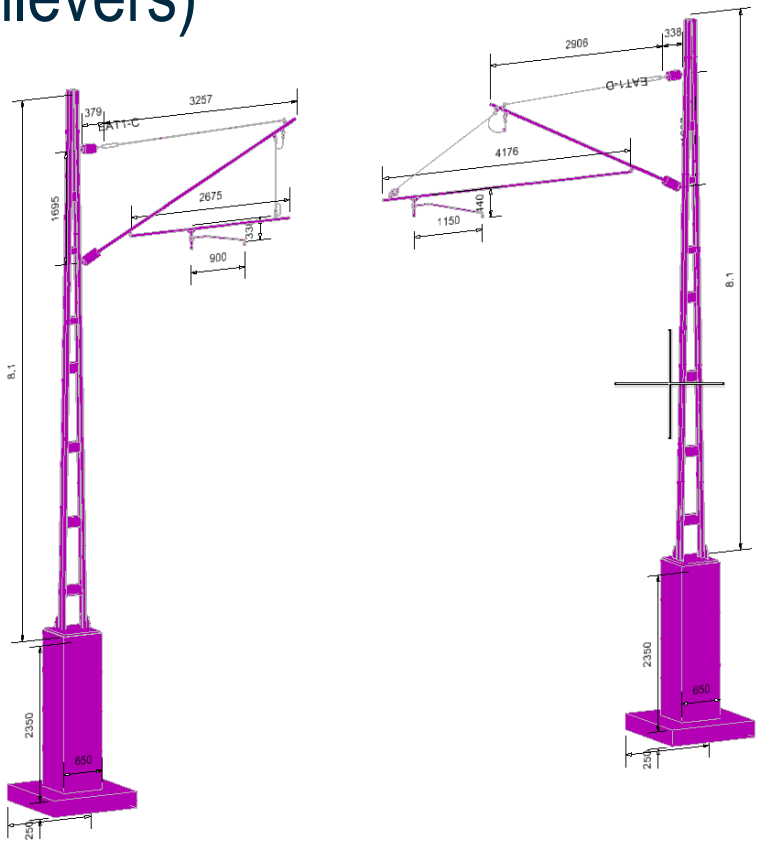
Structures

- Utilizes equipment defined in a database
  - Components (i.e. Nuts, bolts, brackets…)
  - Assemblies (i.e. 3d cells of poles, cantilevers, etc.)
  - Templates
    - Combination of components and assemblies



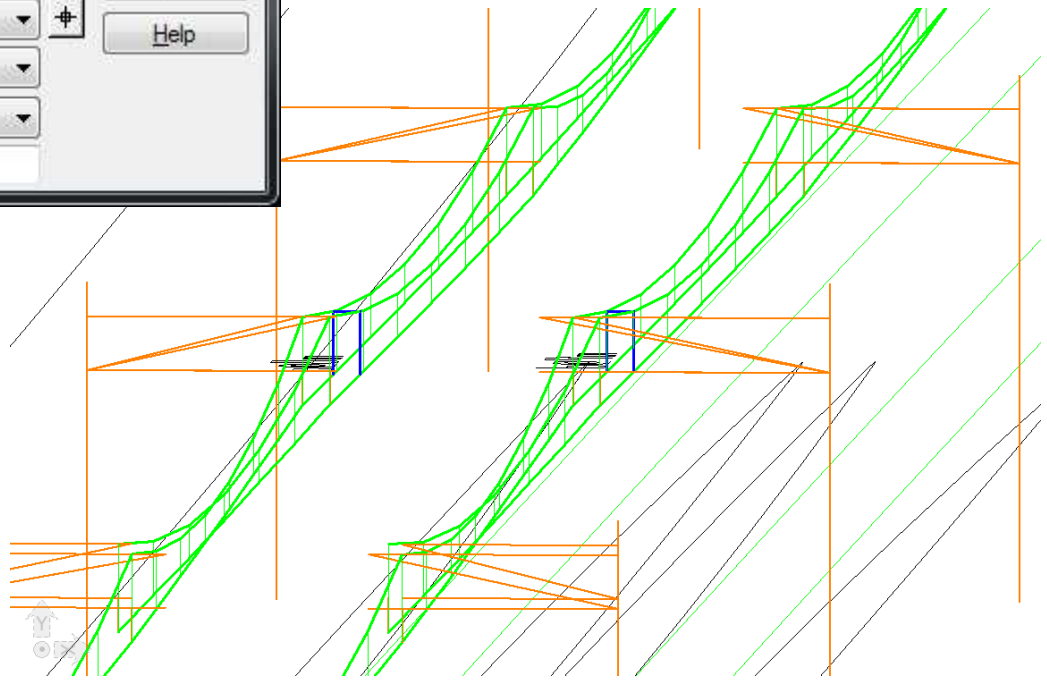
Equipment

- Components (i.e. nuts and bolts)
- Assemblies (i.e. cantilevers)
  - 3D Cells
- Hierarchies
- Templates



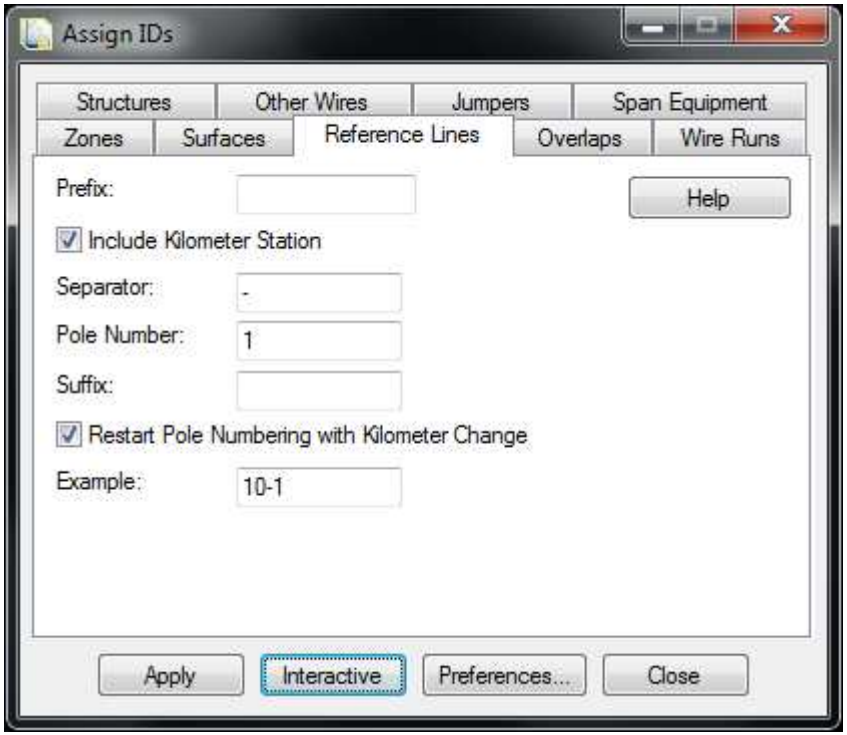
Jumpers

- Creates span bonding between adjacent wires

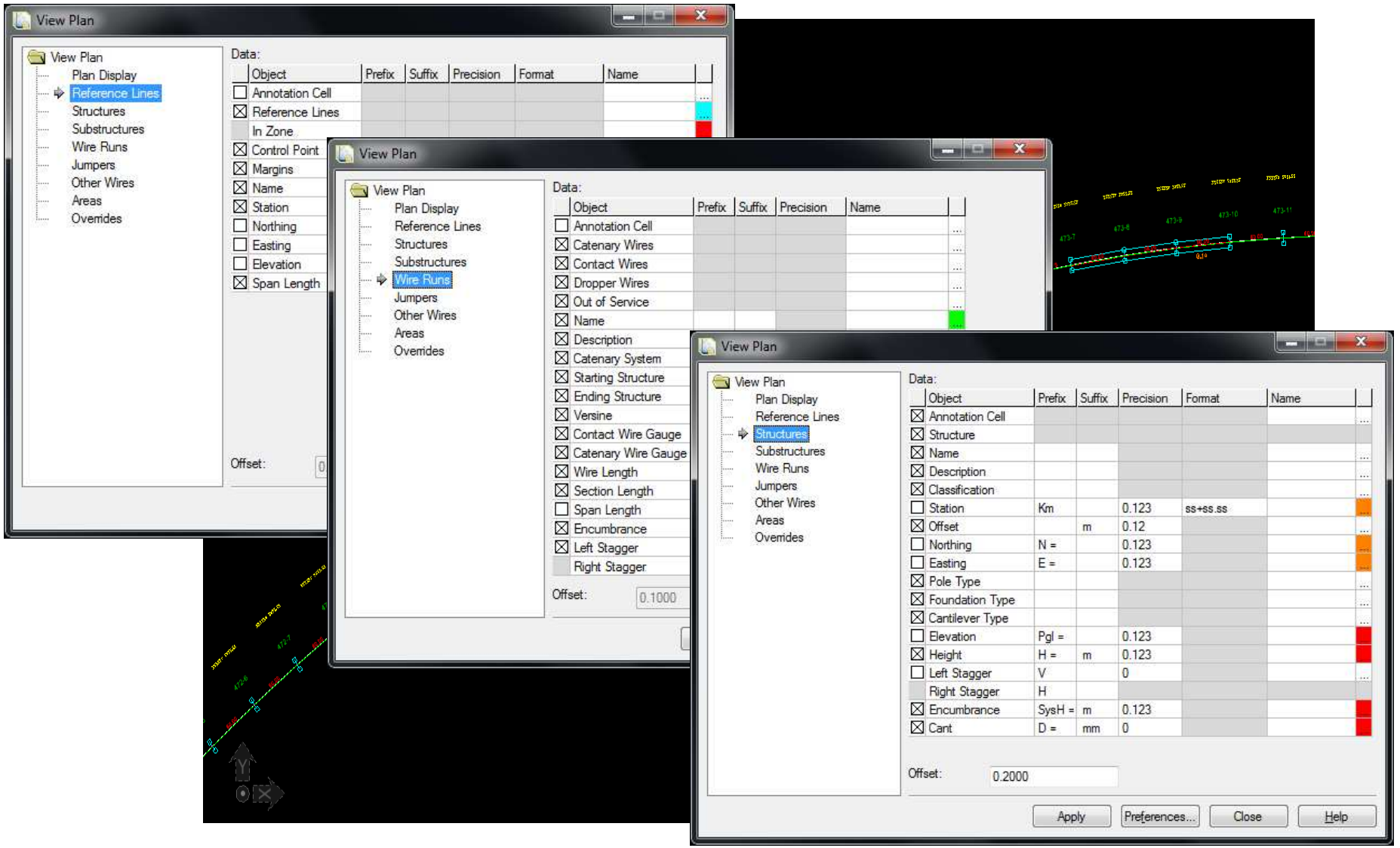


Naming Utility

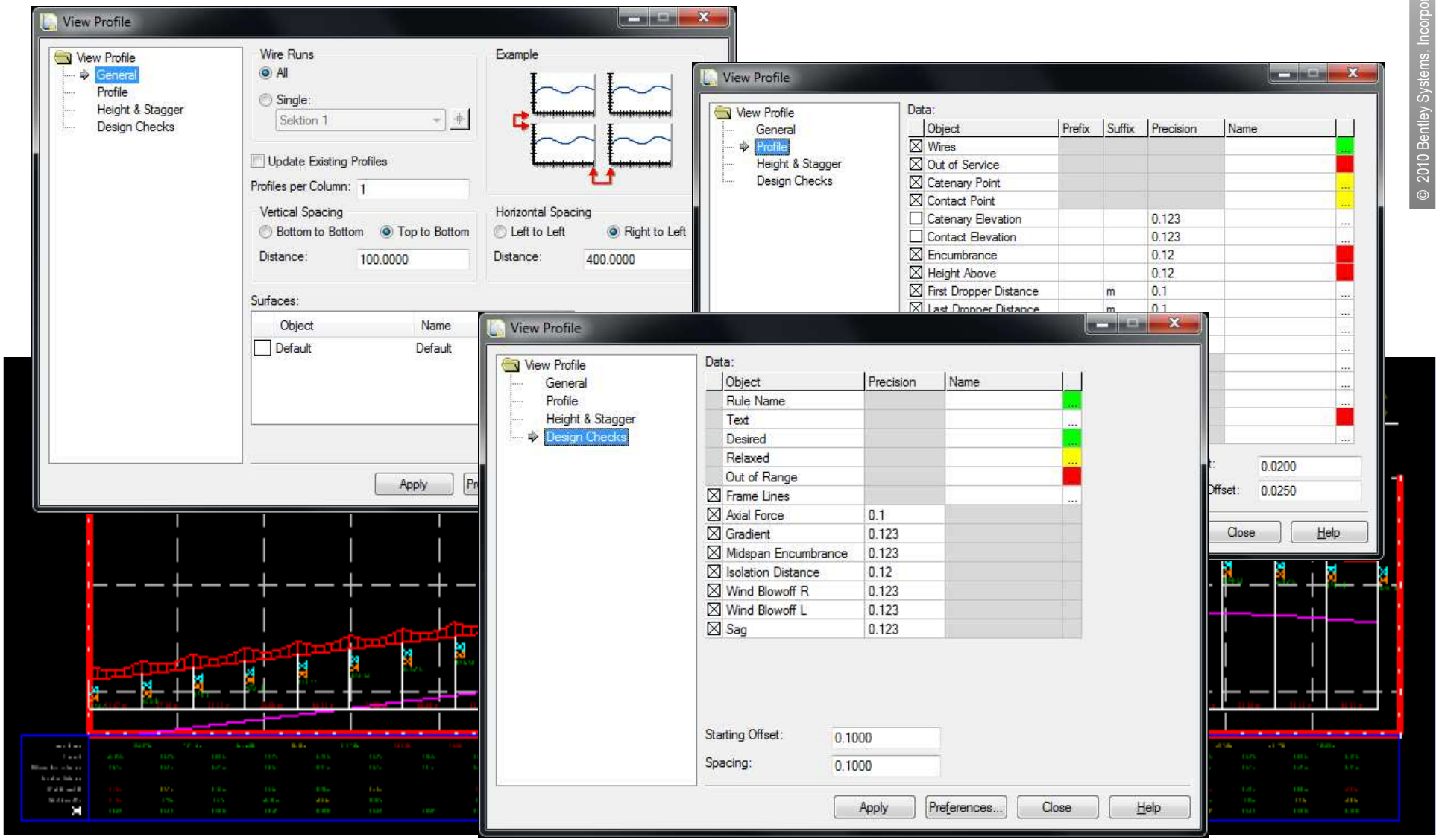
- Naming of,
  - Reference Lines
  - Wire Runs
  - Span Bondings
  - Other Wires
  - Structures
    - Lots of customer variation
- Interactive naming



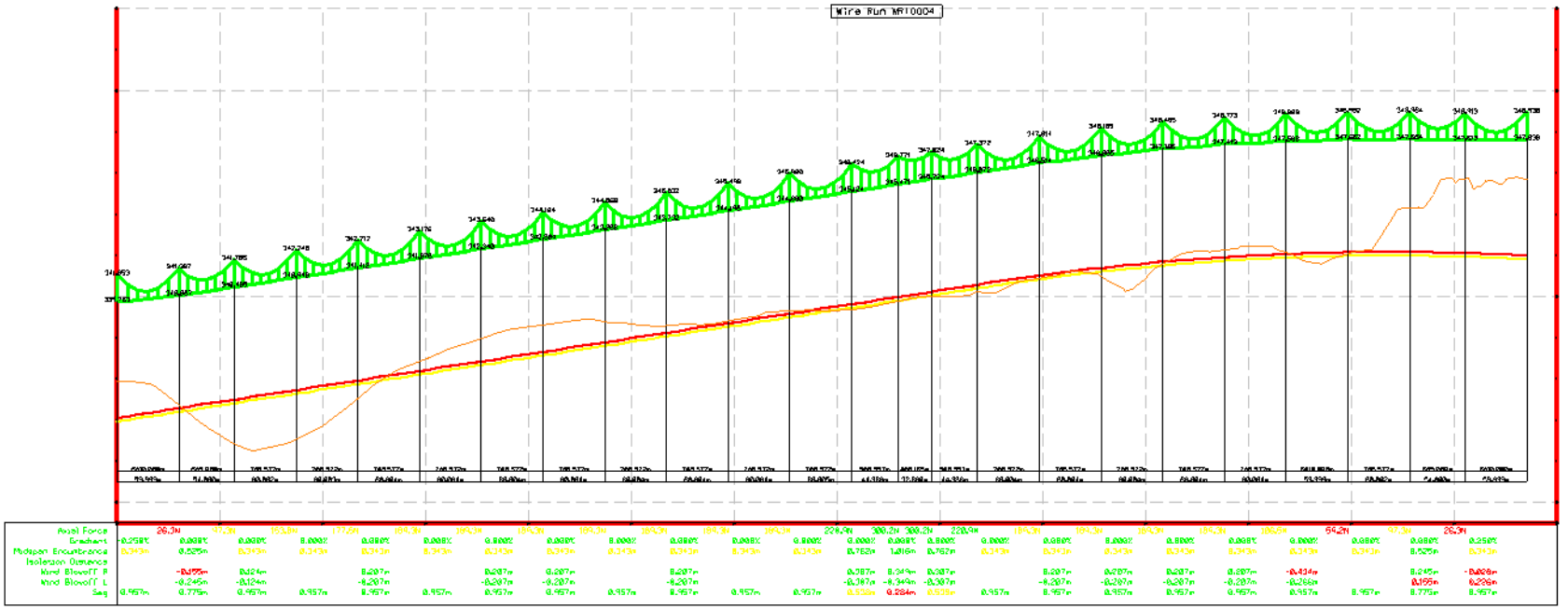
Plan Viewing



Profile Viewing



Example of View Profile Annotation



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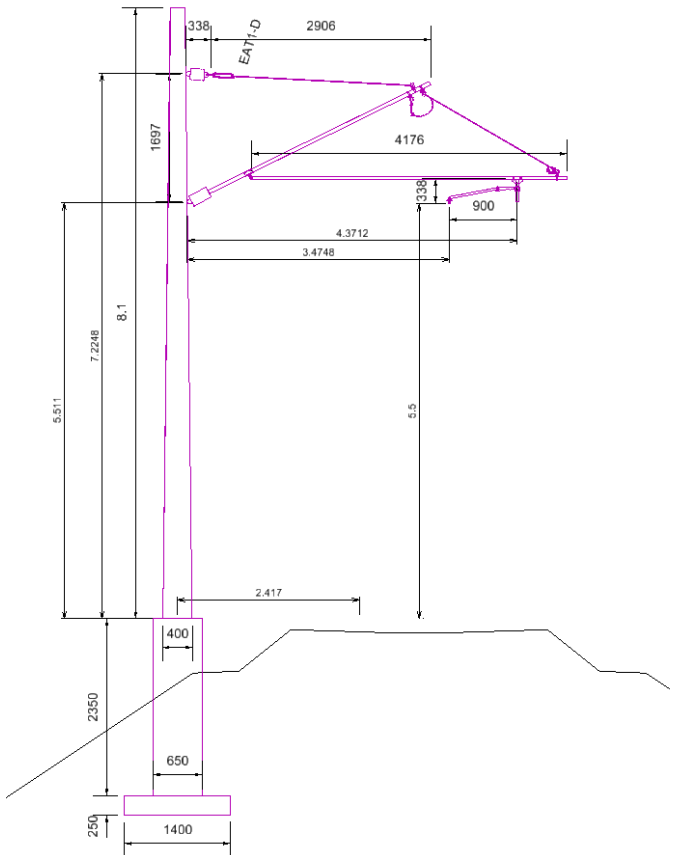
Cross Sections

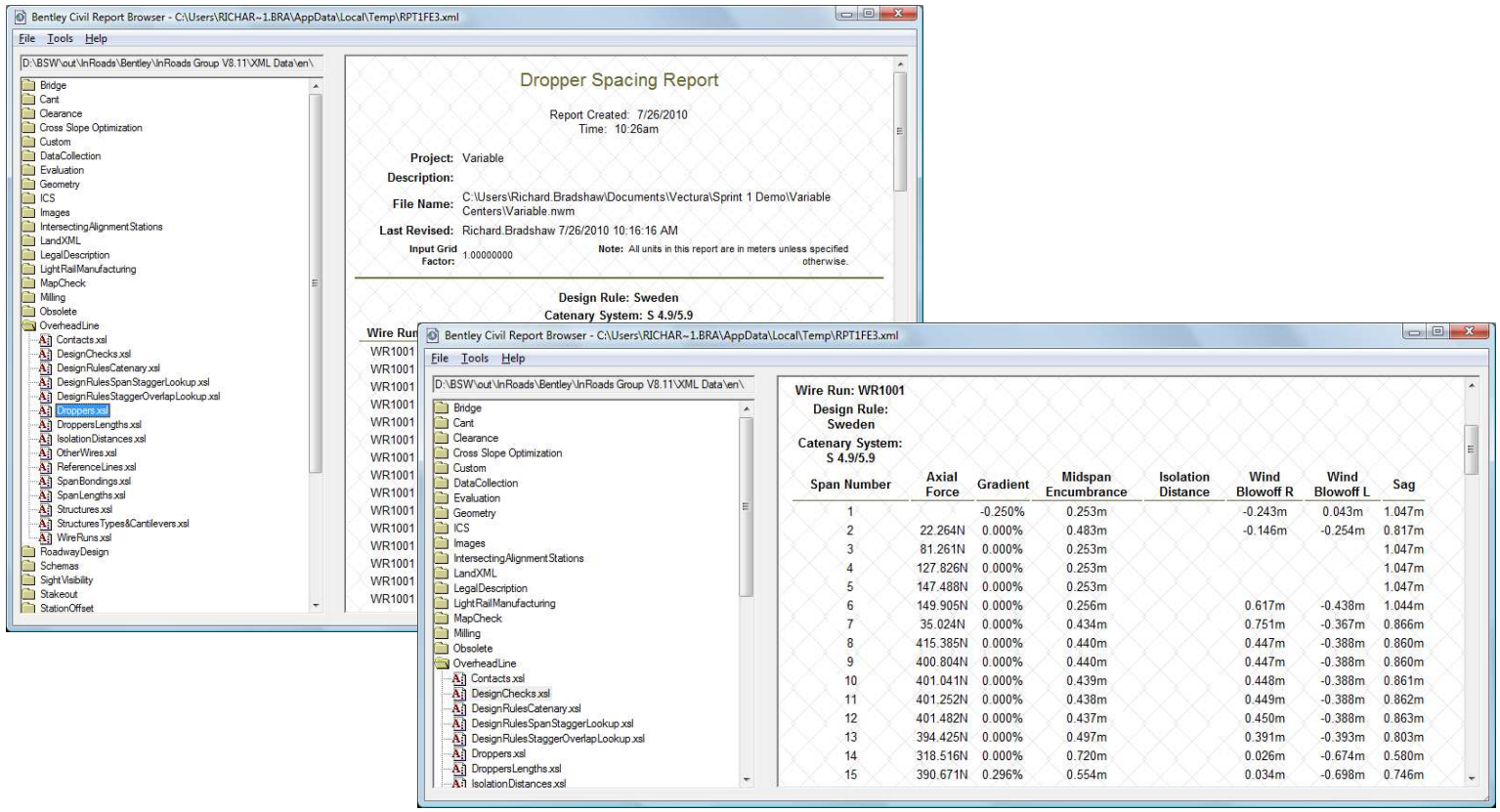
- Graphical data and
- Non-graphic data



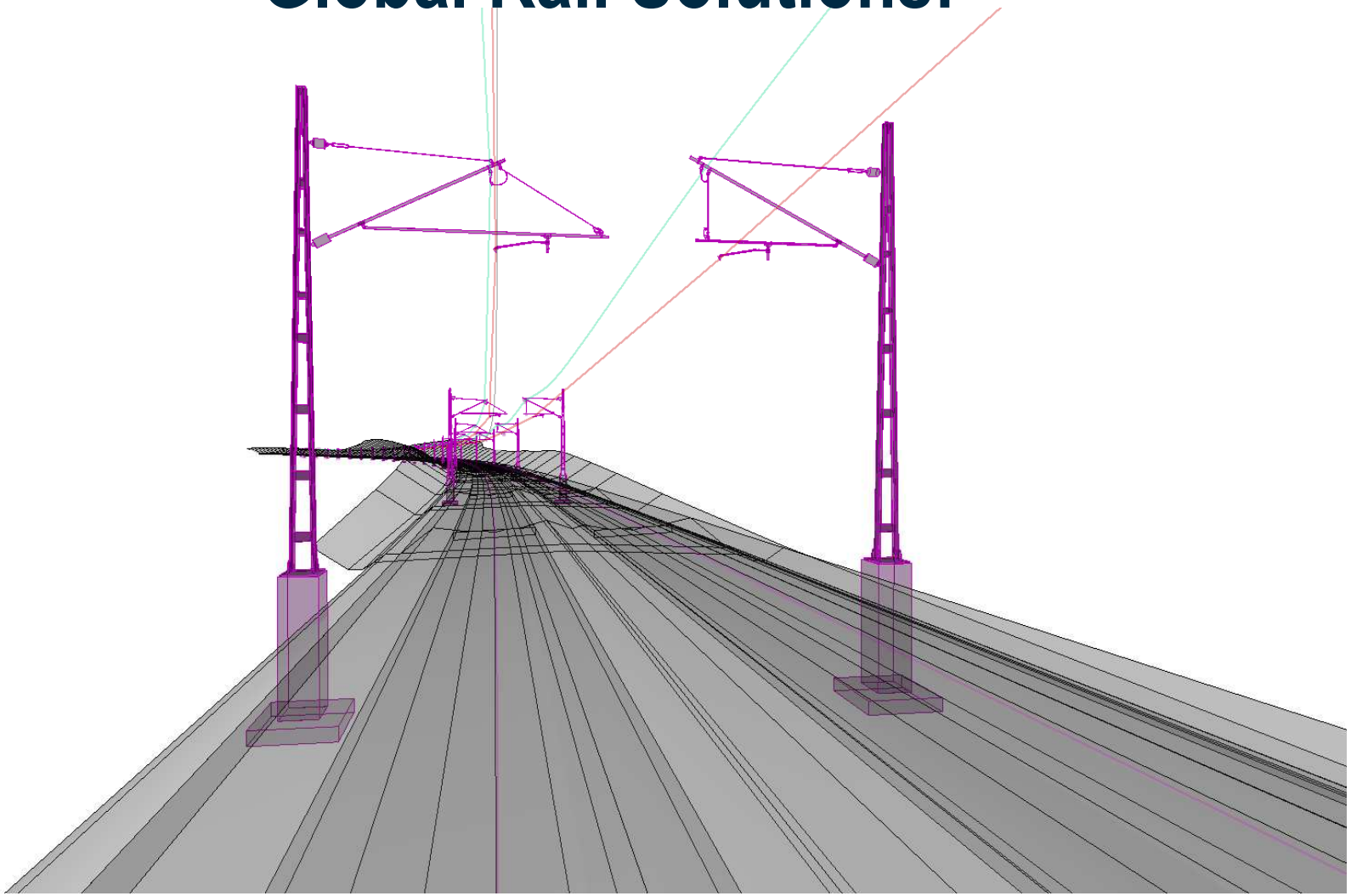
Assembly	Description	Count	Structure	Single Track Post 5	Component	Description	Count
EAT1-D		1	Chainage	7+026.571	1600-104	EAT1-D cantilever assembly	1
steady arm 0.9m - push		1	Orientation	N 17°33'27.78" E	1501-003	concrete footing, pole	1
foundation - pole		1					
Pole 8m		1	Wire	NW			
			Height	5.50			
			Stagger	0.40			
			Encumbrance	1.30			

Reporting

- As always - XML / XSL based



Continuing to *Enhance* and *Create* Global Rail Solutions!



Bentley
Sustaining Infrastructure

Status and planning

- Commercial release is available
- First service release planned to April 2011

Demo…..

Q&A

Thank you!

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