



PV Elite Tips and Tricks

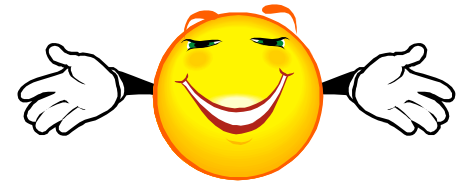
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COADE, Inc.

03/22/10: EDIT THIS IN THE "MASTER" > "SLIDE
MASTER" UNDER THE "INSERT" MENU.

INTERGRAPH®

Welcome



Tips and tricks to make you



This is a Collaboration

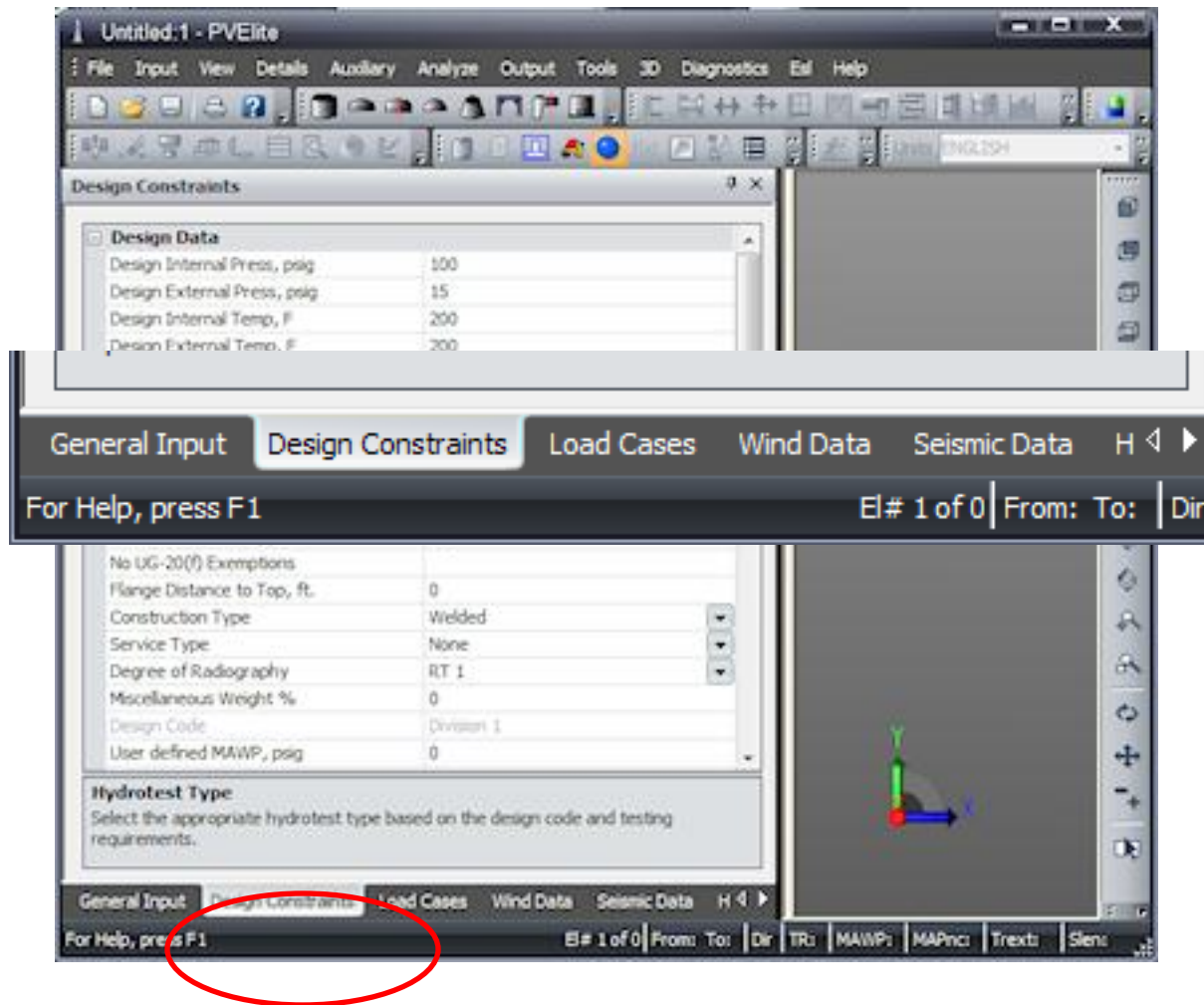


- I will Share some tips with you.
- But you also have to Share your favorite tips.

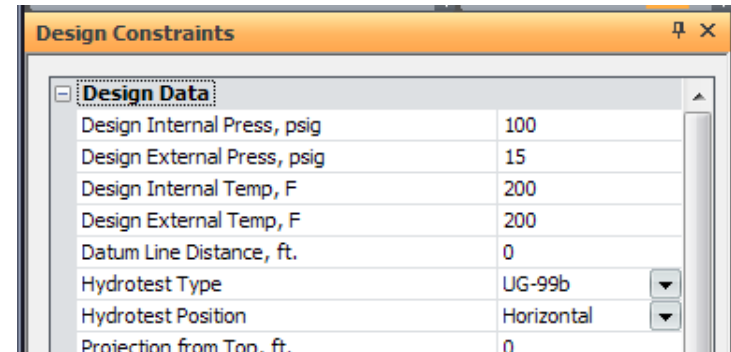
And

- Your feedback.

First add some Global data

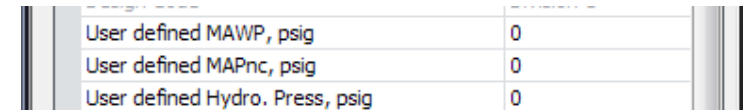


- Pressure/temperatures
- Hydrotest type
- Set the Datum line
- Limiting MAWP (if needed)



The screenshot shows a software dialog box titled "Design Constraints". It contains a table with the following data:

Design Data	
Design Internal Press, psig	100
Design External Press, psig	15
Design Internal Temp, F	200
Design External Temp, F	200
Datum Line Distance, ft.	0
Hydrotest Type	UG-99b
Hydrotest Position	Horizontal
Projection from Top, ft.	0



The screenshot shows a table with the following data:

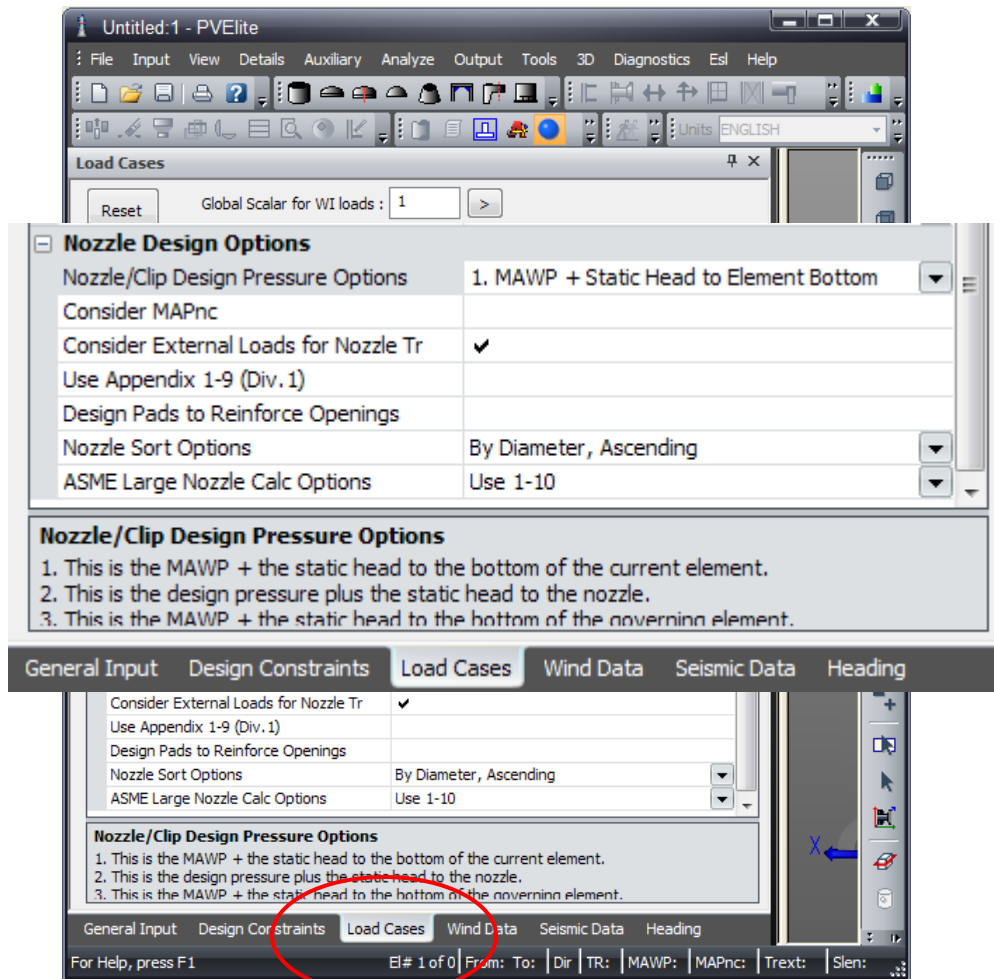
User defined MAWP, psig	0
User defined MAPnc, psig	0
User defined Hydro. Press, psig	0

Design Constraints - Datum

The screenshot displays the PVElite software interface. On the left, the 'Design Constraints' panel is open, showing a list of design parameters. The 'Datum Line Distance, ft.' field is highlighted with a red box and set to 0. The 3D model on the right shows a horizontal vessel with a datum line (green vertical line) and various nozzle locations (LIQ, NOZ) and dimensions (0.20 ft., 0.40 ft.).

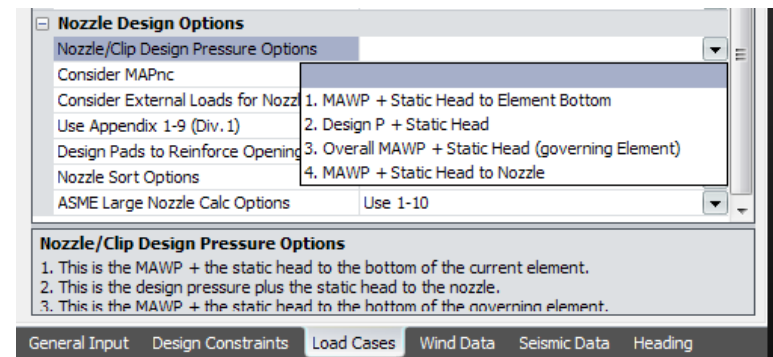
Design Data	
Design Internal Press, psig	300
Design External Press, psig	0
Design Internal Temp, F	450
Design External Temp, F	0
Datum Line Distance, ft.	0
Hydrotest Type	UG-99C
Hydrotest Position	Horizontal
Projection from Top, in.	0
Proj. from Bottom, in.	0
Proj. from Bottom Ope, in.	0
Min. Des Metal Temp, F	0
No UG-20(f) Exemptions	
Flange Distance to Top, ft.	0
Construction Type	Resist. Welded
Service Type	Nonstationary
Degree of Radiography	RT 4
Miscellaneous Weight %	0
Design Code	Division 1
User defined MAWP, psig	0
User defined MAPnc, psig	0

Lets go to Load Cases



Load Cases – Nozzle Design Option

- “MAWP” option prevents nozzle from controlling
- Safeguard against Elevation change
- Design Pressure option – good for re-rating

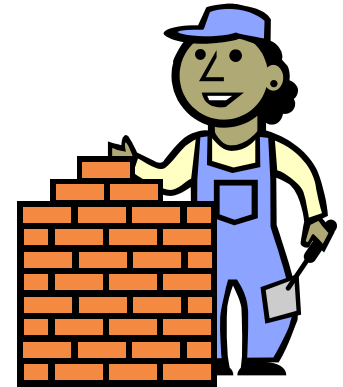


- Design for ‘MAPnc’ – safeguard for hydrotest

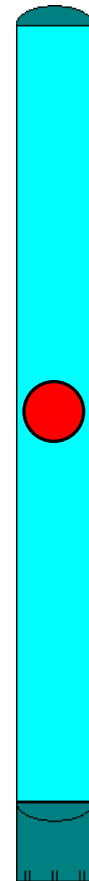
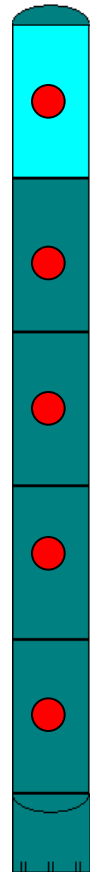
Nozzle/Clip Design Pressure Options	1. MAWP + Static Head to Element Bottom
Consider MAPnc	
Consider External Loads for Nozzle Tr	✓

Let's start building

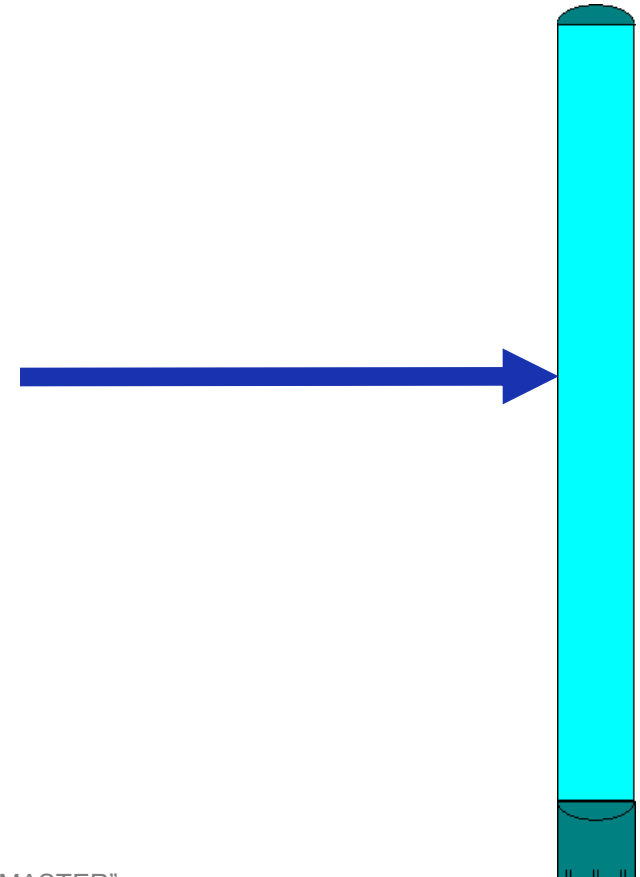
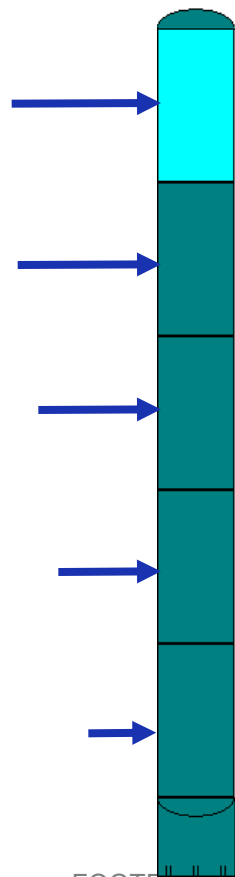
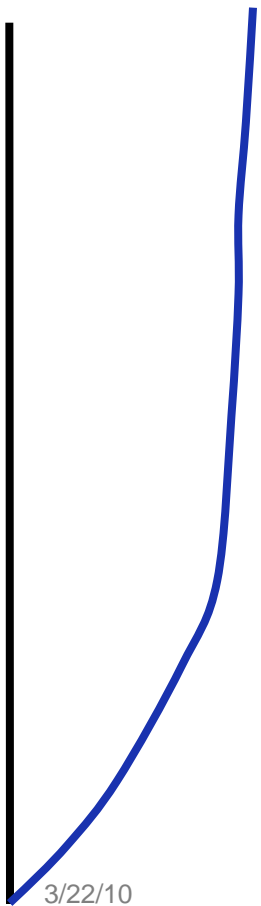
- Add element
- Give Elements descriptive names



- Which is a Realistic Weight Distribution?

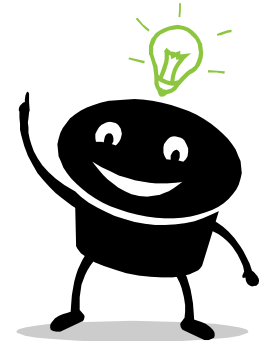


Which is more Accurate modeling of wind loading ?

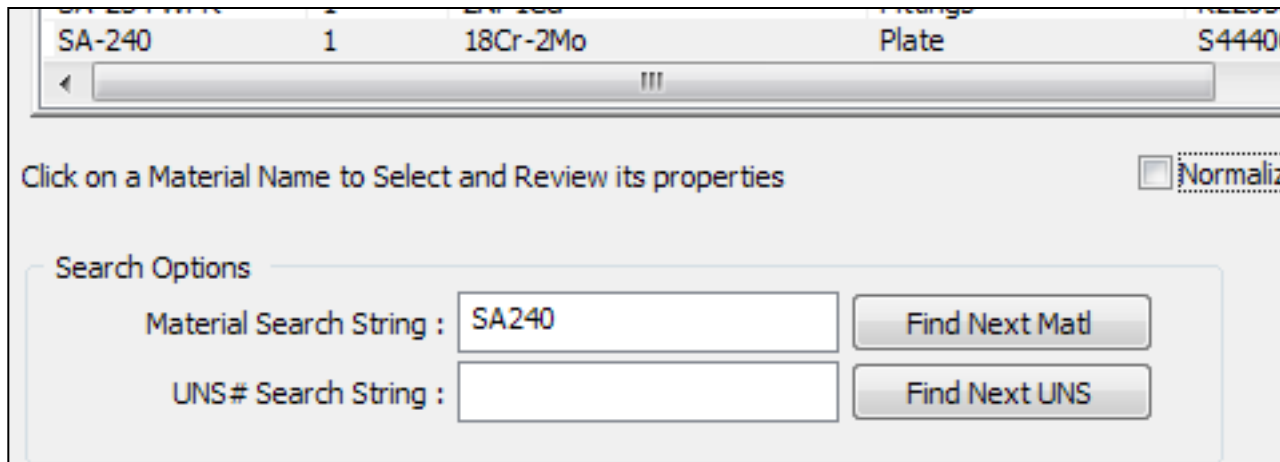
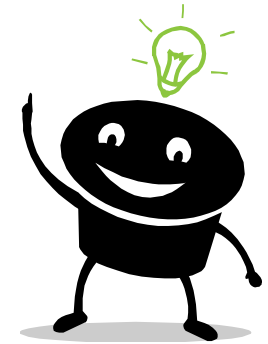
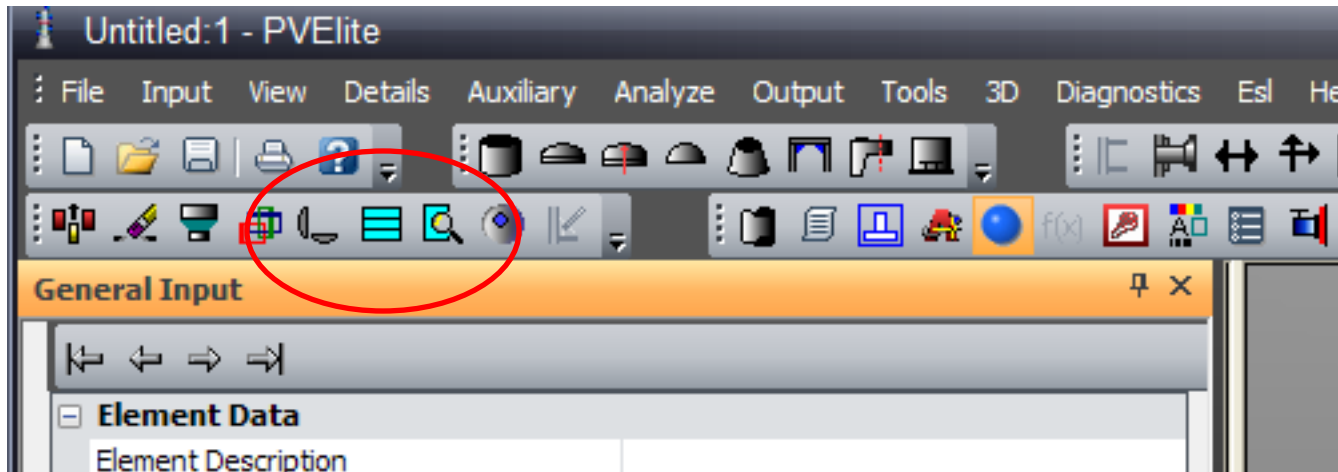


Tip - Shell Length

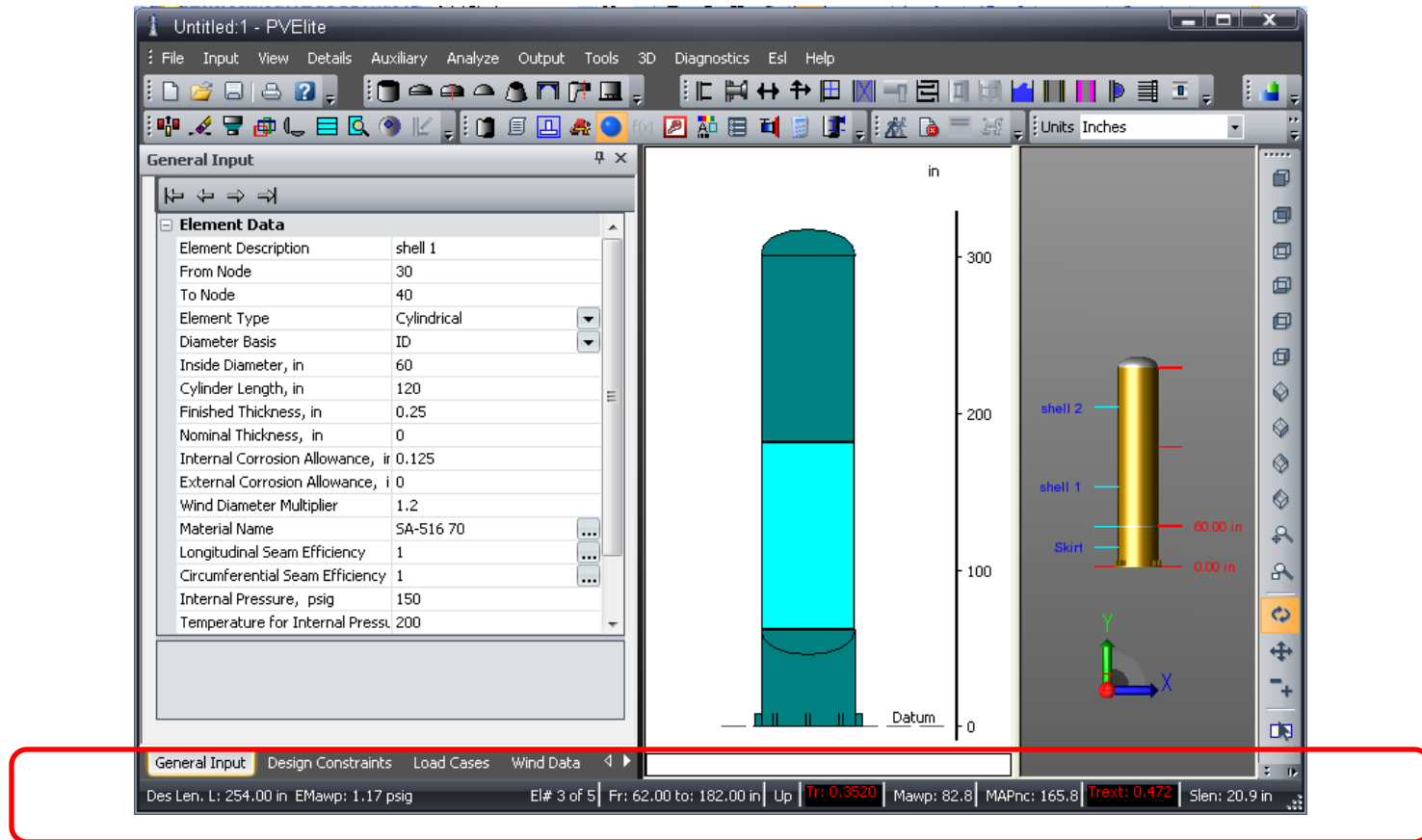
- Use plate length as element lengths, e.g.
 - 10 feet
 - or
 - 3 meters
 - or
 - Other std.



Finding your material



Lets look at the status bar



Status bar – a quick run down

Des Len. L: 254.00 in | EMawp: 1.17 psig | El# 3 of 5 | Fr: 62.00 to: 182.00 in | Up | Tr: 0.3520 | Mawp: 82.8 | MAPnc: 165.8 | Trext: 0.472 | Slen: 20.9 in

Des Len. L: 254.00 in

Design Length for Vacuum calcs.

EMawp: 1.17 psig

Maximum Vacuum Pressure

El# 3 of 5

3rd element out of 5 total

Fr: 62.00 to: 182.00 in

Starting/Ending Element Elevations from datum

Up

Orientation, usu. not needed

Status bar – a quick run down



Des Len. L: 254.00 in EMawp: 1.17 psig El# 3 of 5 | Fr: 62.00 to: 182.00 in | Up **Tr: 0.3520** Mawp: 82.8 MAPnc: 165.8 **Trext: 0.472** Slen: 20.9 in

Tr: 0.3520

Internal Pressure required Thickness

Mawp: 82.8

Maximum Internal Pressure

MAPnc: 165.8

Maximum Pressure in New & Cold cond.

Trext: 0.472

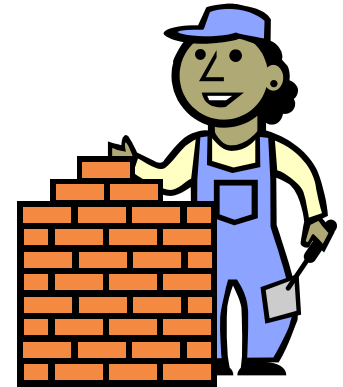
Required Thickness for Vacuum case

Slen: 20.9 in

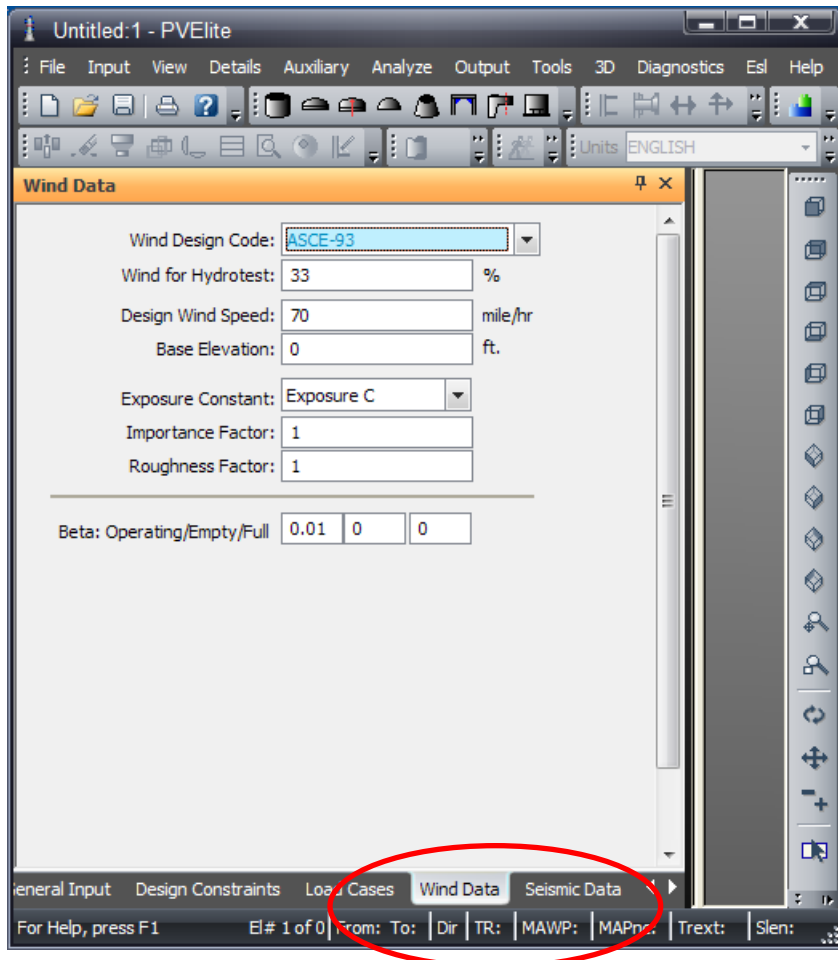
Maximum distance before ring needed

Let's Continue building

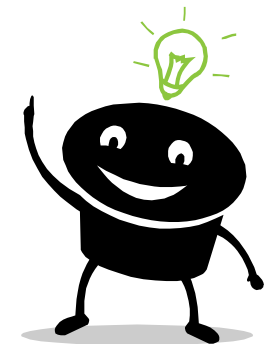
- Check the on-screen results
- Fix **only** the **Internal Pressure** failures
- Complete the Pressure Envelope



Now add Wind/Seismic loading



- Analyze your job.
- Satisfy Internal Pressure
- Satisfy combined loads
- Now, we are ready to check for vacuum



Now lets check for Vacuum

Des Len. L: 254.00 in | EMawp: 1.17 psig | El# 3 of 5 | Fr: 62.00 to: 182.00 in | Up | Tr: 0.3520 | Mawp: 82.8 | MAPnc: 165.8 | Trest: 0.472 | Slen: 20.9 in

Des Len. L: 254.00 in

Trest: 0.472

- Place a ring at a distance of "Slen"

Slen: 20.9 in

Design Length for Vacuum calcs.

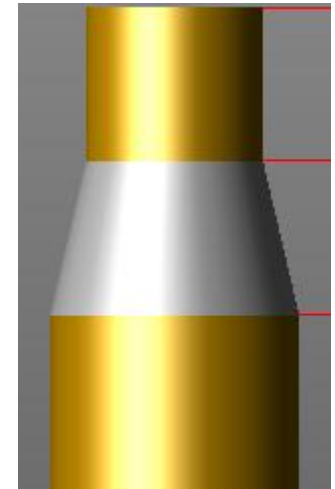
Required Thickness for Vacuum case

Maximum distance before ring needed

Cone-Cylinder Junction options

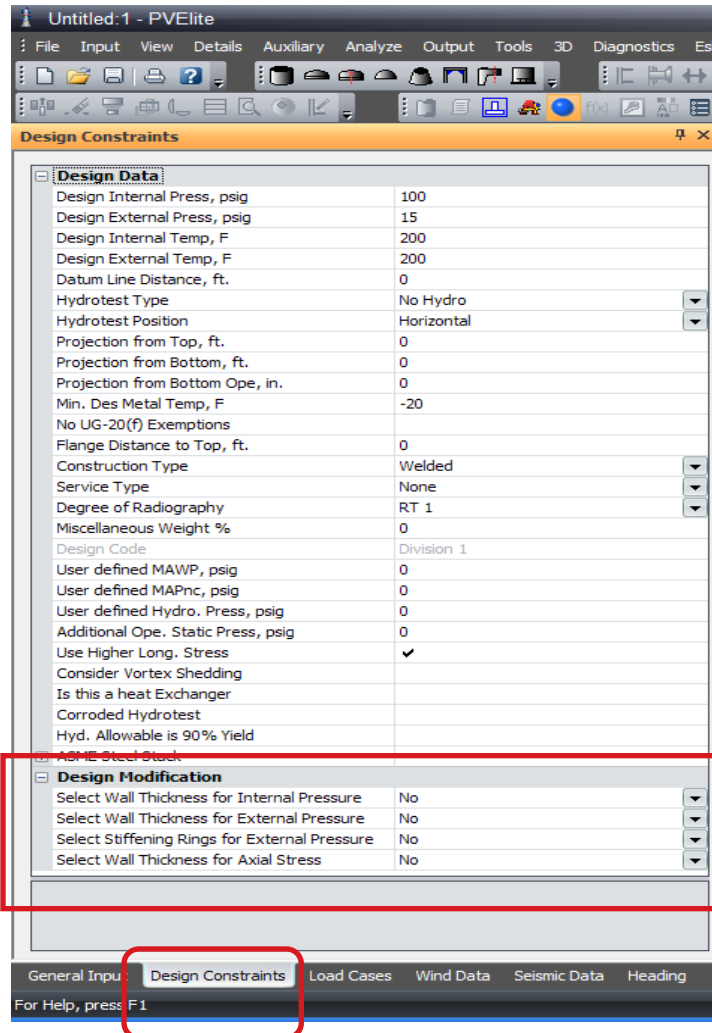
Property	Value
To Node	30
Element Type	Conical
Diameter Basis	ID
'From' End Diameter, in.	96
Cone Length, ft.	5
Finished Thickness, in.	0.5
Nominal Thickness, in.	0
Internal Corrosion Allowance, in.	0.125
External Corrosion Allowance, in.	0
Wind Diameter Multiplier	1.2
Material Name	SA-516 70
Longitudinal Seam Efficiency	1
Circumferential Seam Efficiency	1
Internal Pressure, psig	100
Temperature for Internal Pressure, F	200
External Pressure, psig	15
Temperature for External Pressure, F	200
Additional Element Data	
'To' End Inside Diameter, in.	68
Cone Length, in.	60
Half Apex Angle	0
Line of Support Options	Both Ends a Line of Support
Toriconical	Not a Line of Support
Concentric	Both Ends a Line of Support
Shell Section	Small End a Line of Support
	Large End a Line of Support

Line of Support Options
For ASME VIII-1, select the appropriate Line of Support option, see UG-28.1.



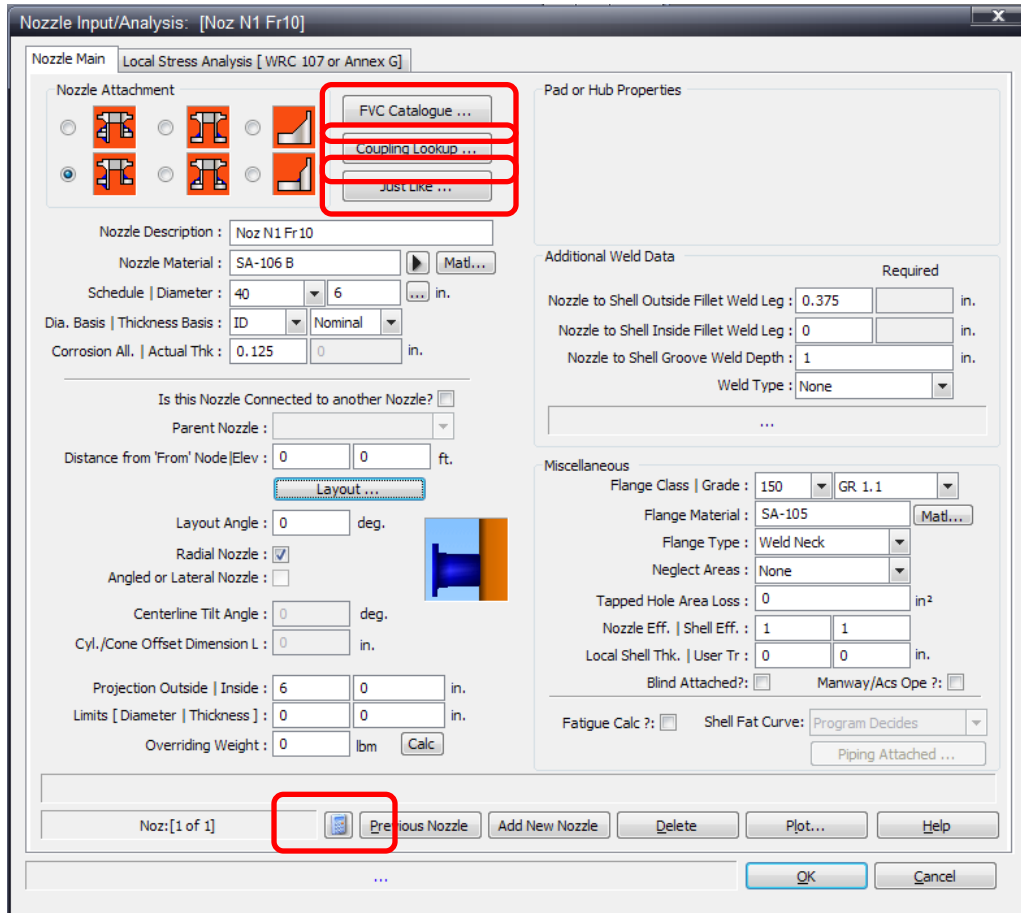
Try other design options as well.

Program Auto design Options



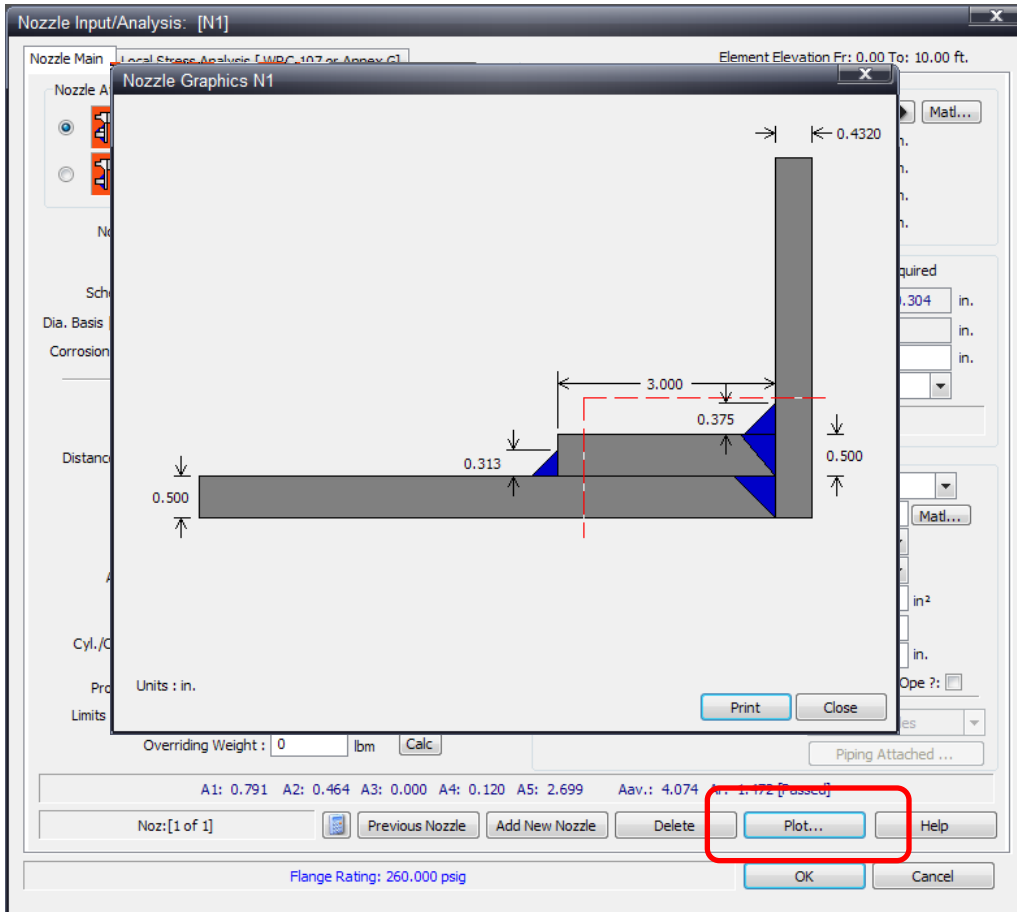
- Auto-select thickness for pressure
- Auto-select thickness for Vacuum
- Select rings for Vacuum
- Select thickness for combined wind/seismic/wt.

Now let's add Nozzles



- Try these :
 - FVC catalog
 - Coupling lookup
 - “Just like”
 - View Results

What's wrong here ?



- Using “Plot” button
- Watch for “reinforcement limits” in red dotted line.

Store & Apply Std. Nozzle loads

Nozzle Input/Analysis: [Noz N1 Fr10]

Local Stress Analysis [WRC 107 or Annex G] Element Elevation Fr: 0.00 To: 10.00 ft.

Calculation Method: No Calc PD:5500 WRC 107

Load Convention System: Local Global

	Sustained	Expansion	Occasional	
Radial force P :	1169.01	1753.51	0	lb.
Circ. shear force Vc :	881.251	1321.88	0	
Long. shear force Vl :	-1169.01	-1753.51	0	
Circ. moment Mc :	1917.66	2876.49	0	ft.lb.
Long. moment Ml :	2507.71	3761.57	0	
Torsional moment Mt :	-2891.24	4226.87	0	

Length "L": 0 in. Nozzle Pressure Thrust:

Tangent Offset Distance: 0 in. Use Division 2 Stress Indices:

Occasional Press Difference: 0 psig Use WRC 368:

Use Kn and Kb:

Fillet Radius: Nozzle: 0 Pad: 0

Direction Cosines: Vessel: VX: 0 VY: 1 VZ: 0 Nozzle: NX: 1 NY: 0 NZ: 0 Node #: 10

Allowable Stress Intensity factors at Nozzle Edge: Factor for Membrane Stresses: 1 Factor for Membrane + Bend Stresses: 2.25 Print Membrane Stress at Nozzle Edge:

Allowable Stress Intensity factors at Pad Edge: Factor for Memb Stresses: 1.2 Fact for Memb+Bend Stresses: 2.25

Computed Stress Intensities/Ratios at the nozzle edge and pad edge Pass/Fail Status

Edge of Nozzle:	Maximum calculated stress ratio: 0.243	Passed
Edge of Pad:	Maximum calculated stress ratio: 0.388	Passed

Theoretical Individual Max Loads per Annex G.2.8: Not Calculated

Flange Rating: 260.000 psig

OK Cancel

- Store std. loads
- Import loads on nozzle

Import piping loads from CAESAR II

Nozzle Input/Analysis: [Noz N1 Fr10]

Nozzle Main Local Stress Analysis [WRC 107 or Annex G] Element Elevation Fr: 0.00 To: 10.00 ft.

Calculation Method
 No Calc PD:5500 WRC 107

Load Convention System
 Local Global

	Sustained	Expansion	Occasional
Force Fx :	1169.01	1753.51	0
Force Fy :	-1169.01	-1753.51	0
Force Fz :	-881.251	-1321.88	0
Moment Mx :	2891.24	4336.87	0
Moment My :	-1917.66	-2876.49	0
Moment Mz :	-2507.71	-3761.57	0

lb.
ft.lb.

Length "L": 0 in.
Tangent Offset Distance: 0
Occasional Press Difference: 0 psig

Include Pressure Thrust :
Use Division 2 Stress Indices :
Use WRC 368 :
Use Kn and Kb :

Fillet Radius
Nozzle: 0
Pad: 0

Direction Cosines
Vessel :
VX : 0
VY : 1
VZ : 0
Nozzle :
NX : 1
NY : 0
NZ : 0
Node # : 10

Allowable Stress Intensity factors at Nozzle Edge
Factor for Membrane Stresses: 1
Factor for Membrane + Bend Stresses: 2.25
Print Membrane Stress at Nozzle Edge :

Allowable Stress Intensity factors at Pad Edge
Factor for Memb Stresses: 1.2
Fact for Memb+Bend Stresses: 2.25

Computed Stress Intensities/Ratios at the nozzle edge and pad edge Pass/Fail Status

Edge of Nozzle:	Maximum calculated stress ratio: 0.243	Passed
Edge of Pad:	Maximum calculated stress ratio: 0.388	Passed

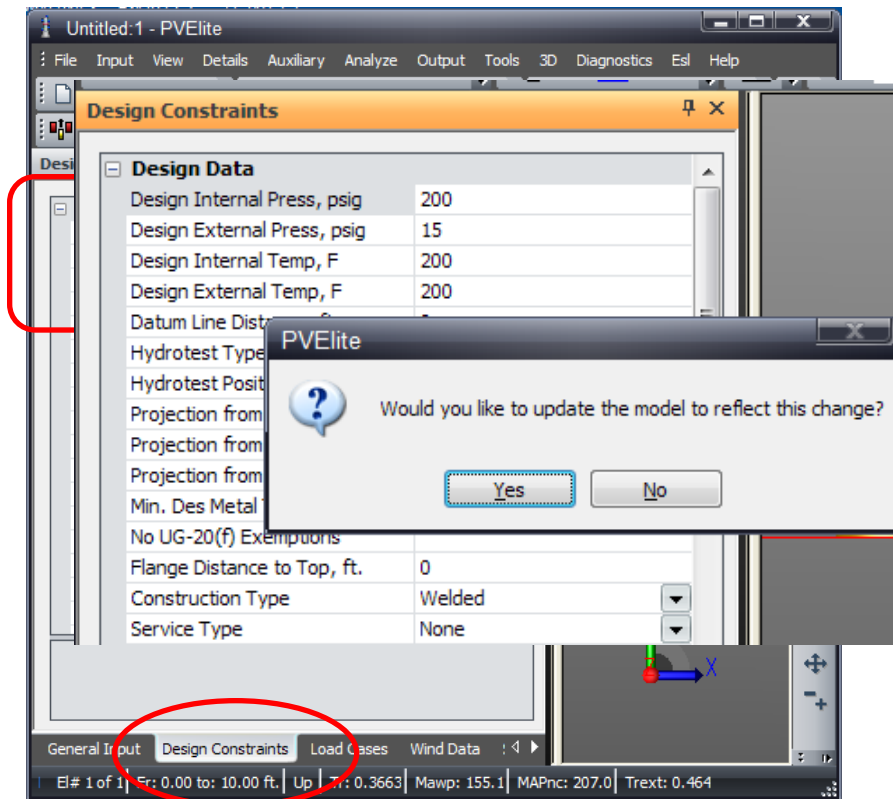
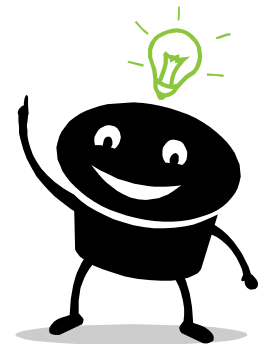
Theoretical Individual Max Loads per Annex G.2.8
Not Calculated

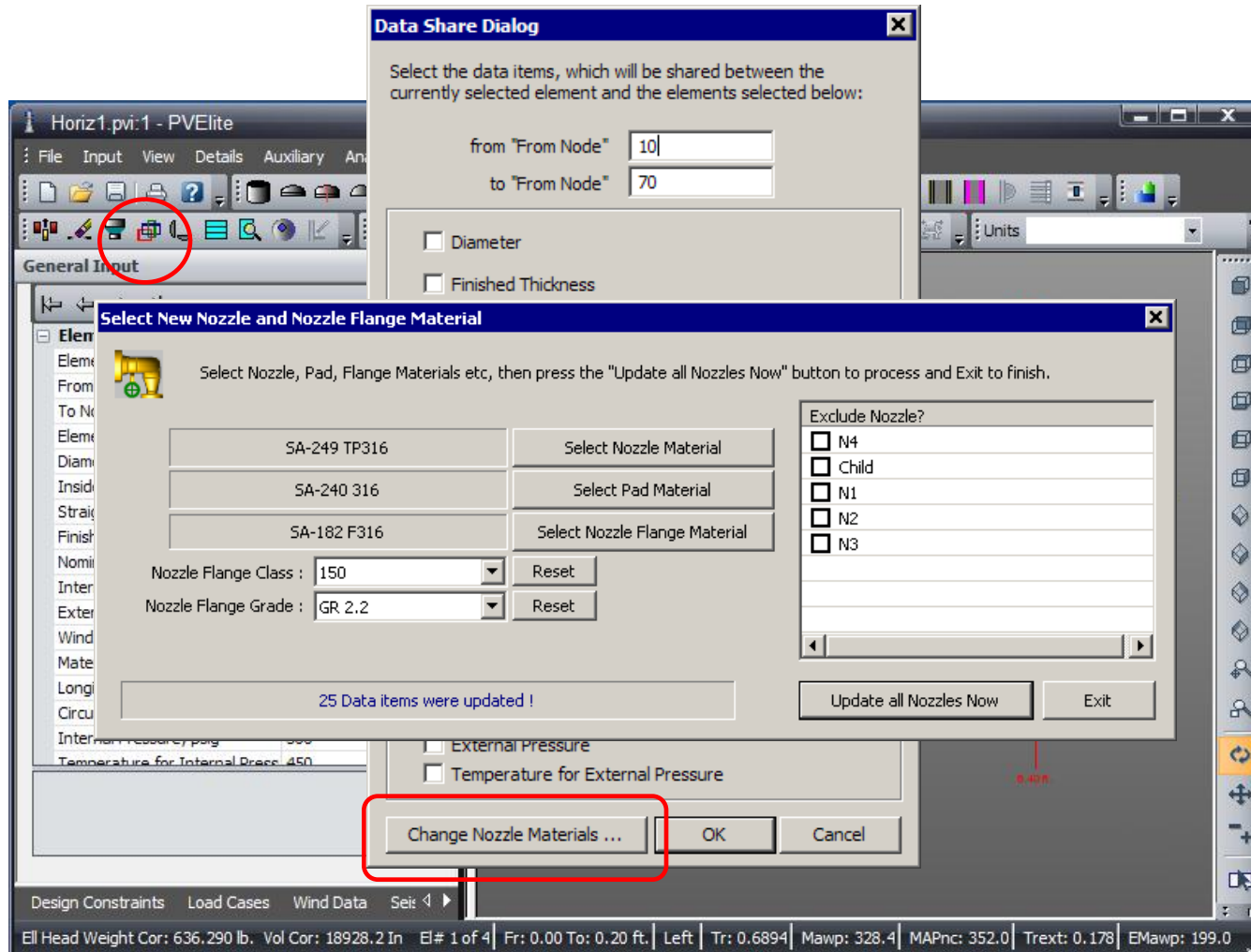
Flange Rating: 260.000 psig

OK Cancel

- Specify,
 - Global conv.
 - direction cosines
 - Node #
- Import loads from C2 file

- Global Pressures/Temperatures change





List Dialog for fast manipulation

Detail Listing

Click here to add a row Adjust detail elevations by: 0 ft. + Up|Right, - Down|Left
 but only for "From" Nodes > or = : 0

Nozzle Listing	From Node	Description	From Datum ft. or Offset (Heads) in.	Layout Angle	Nozzle Type	Nozzle Sch.	Nominal Diameter in.	Dia. Basis ID or OD	Thickness Basis	Corrosion All. in.	Act
1	10	10 NOZ	20.0000	0.0000	4 Abutting w/Pad	80	4.0000	1 ID	Nominal	0.0000	
2	20	B	1.2000	0.0000	1 Insert w/Pad	40	4.0000	1 ID	Nominal	0.0000	
3	20	20 NOZ 2	3.7000	90.0000	1 Insert w/Pad	40	4.0000	1 ID	Nominal	0.0000	
4	20	Boot Nozzle	5.7000	180.0000	1 Insert w/Pad	40	8.0000	1 ID	Nominal	0.0000	
5	20	20 NOZ 4	7.2000	0.0000	4 Abutting w/Pad	80	10.0000	1 ID	Nominal	0.0000	
6	20	boot_n1	0.7000	180.0000	2 Insert wo/Pad	80	1.5000	1 ID	Nominal	0.0000	
7	30	25 NOZ 1	10.0000	0.0000	1 Insert w/Pad	80	6.0000	1 ID	Nominal	0.0000	
8	30	25 NOZ 2	20.0000	150.0000	1 Insert w/Pad	80	4.0000	1 ID	Nominal	0.0000	
9	40	sn	0.0000	0.0000	2 Insert wo/Pad	160	1.0000	1 ID	Nominal	0.0500	

Calculate: Platform Wind Area Platform Weight

Nozzle Database and change options: Ansi Imperial

Full Nozzle/Shell Groove Welds

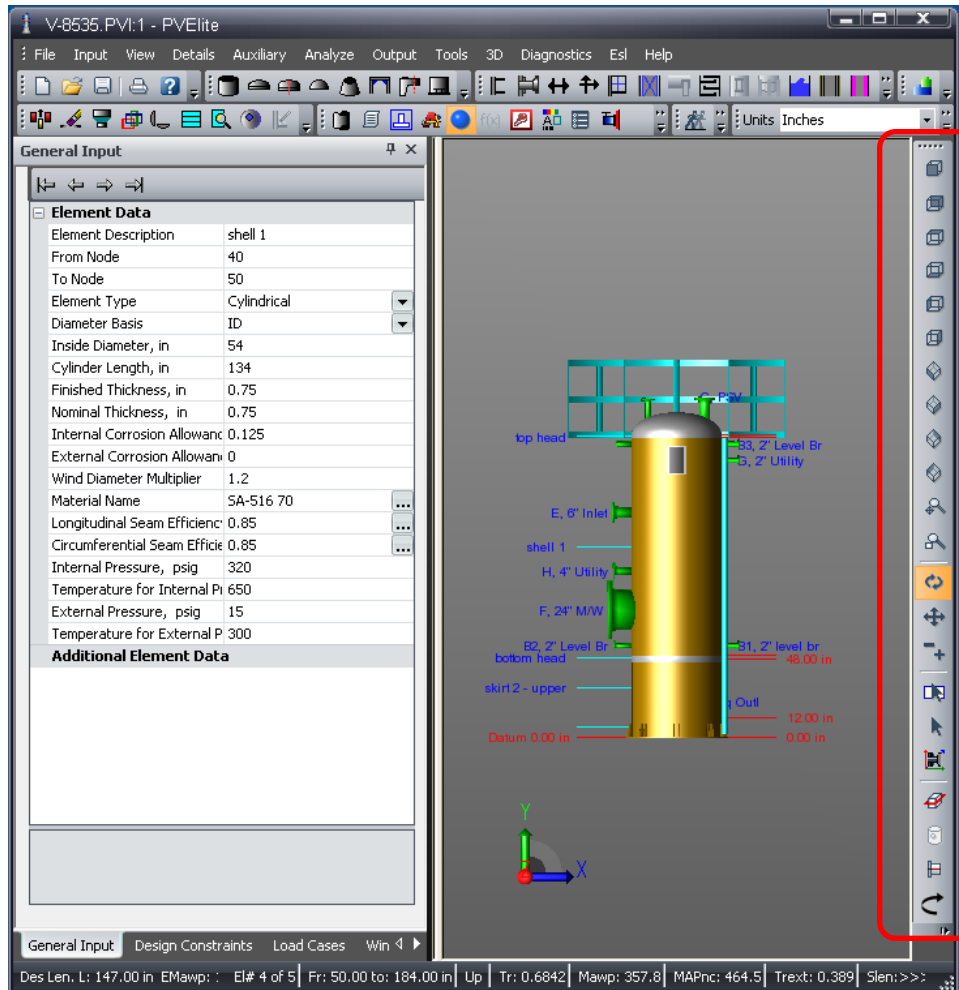
Full Pad/Shell Groove Welds

Hint: Use Control C and Control V to duplicate a row

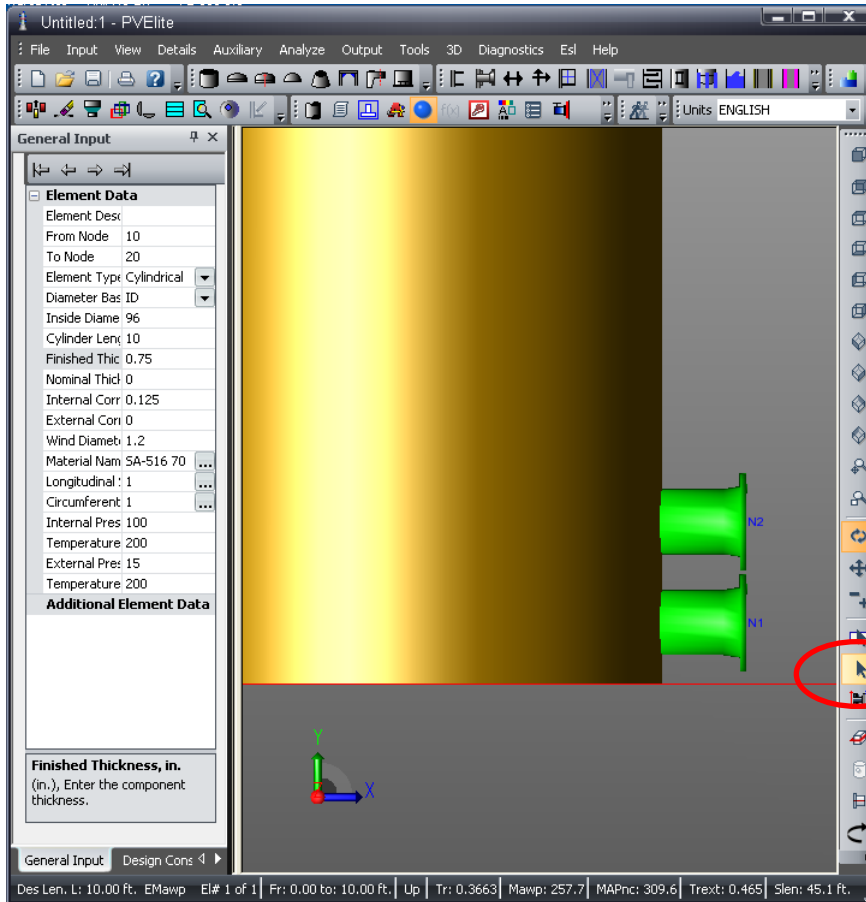
Notes:
 1- Weights, Force/Moments and Packing on Heads cannot be modified or deleted from the list.
 2- Only Data under selected tabs will be printed!

Print Ok Cancel

Lets look at the 3D palette.

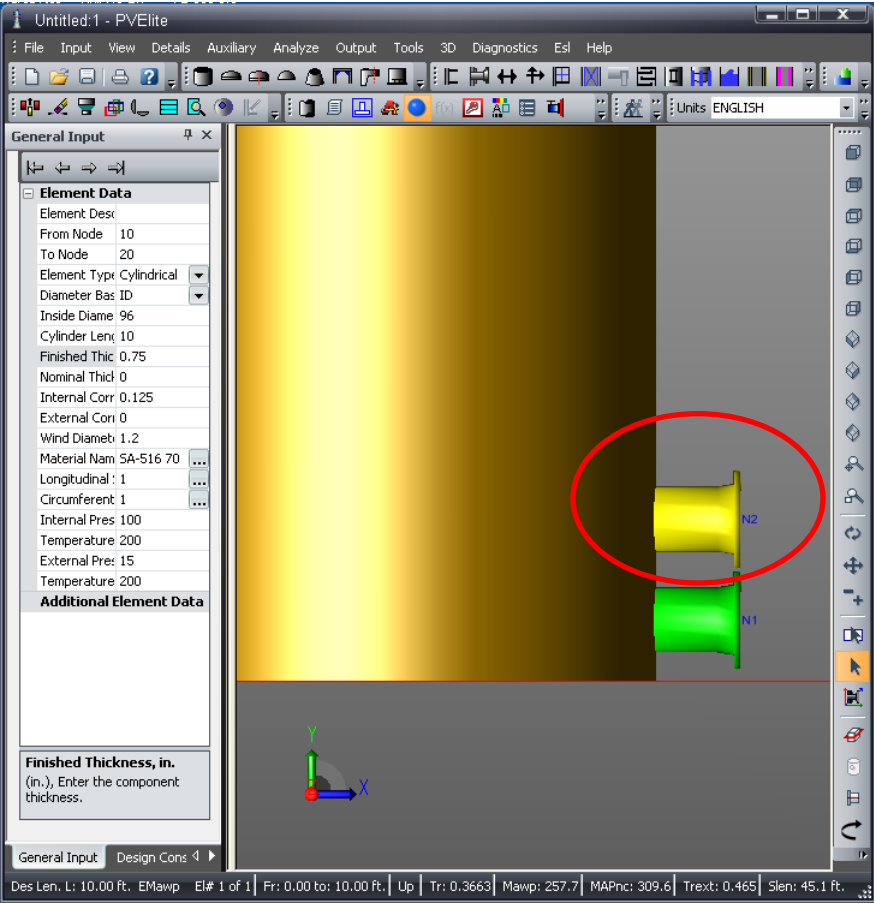


Visually Translate Nozzles, rings etc.



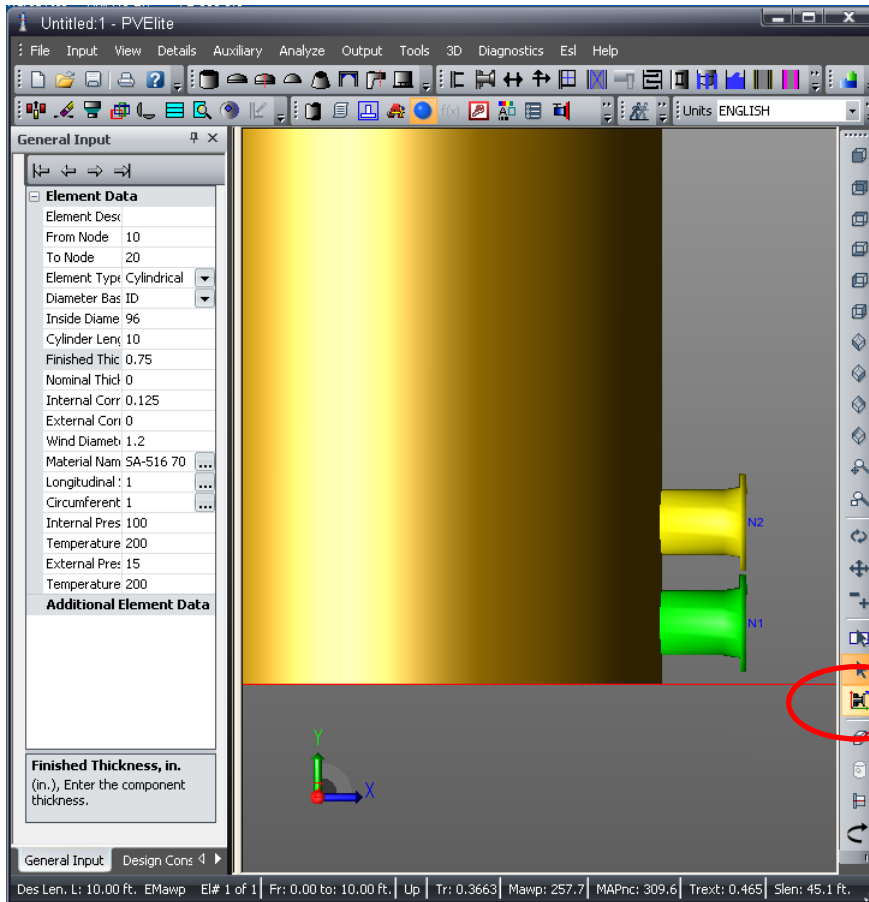
Click on the “Select-by-Click” icon

Translating a nozzle



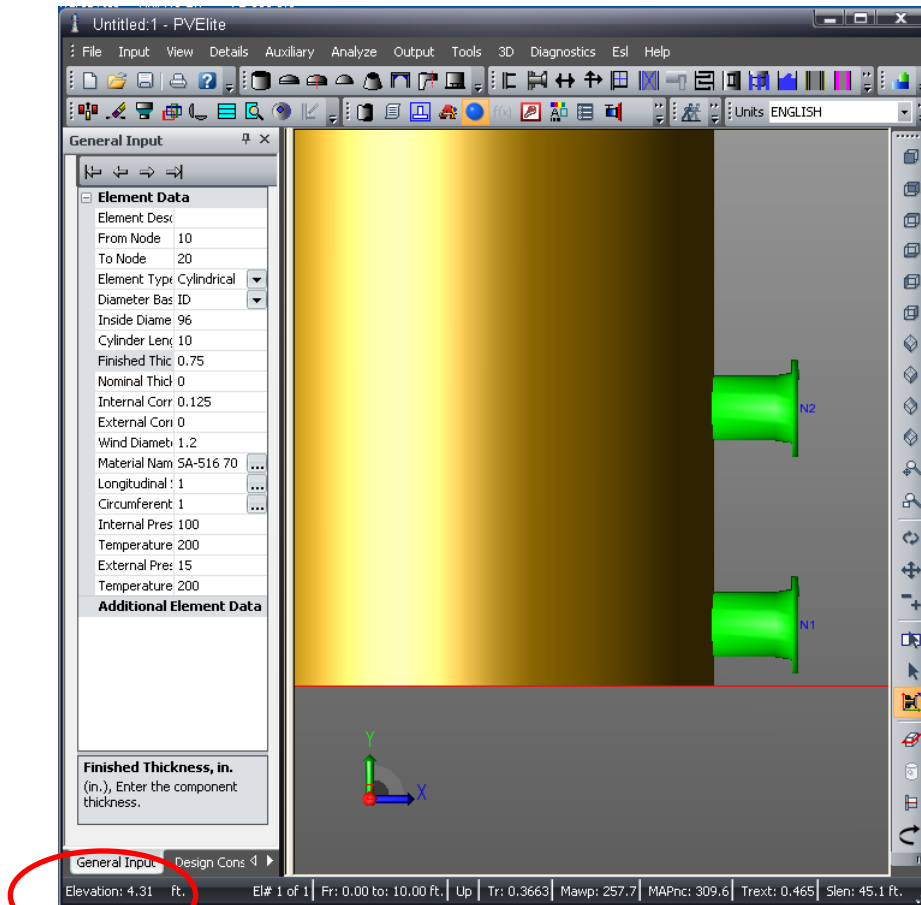
Click and Select the nozzle to move.

Translating a nozzle



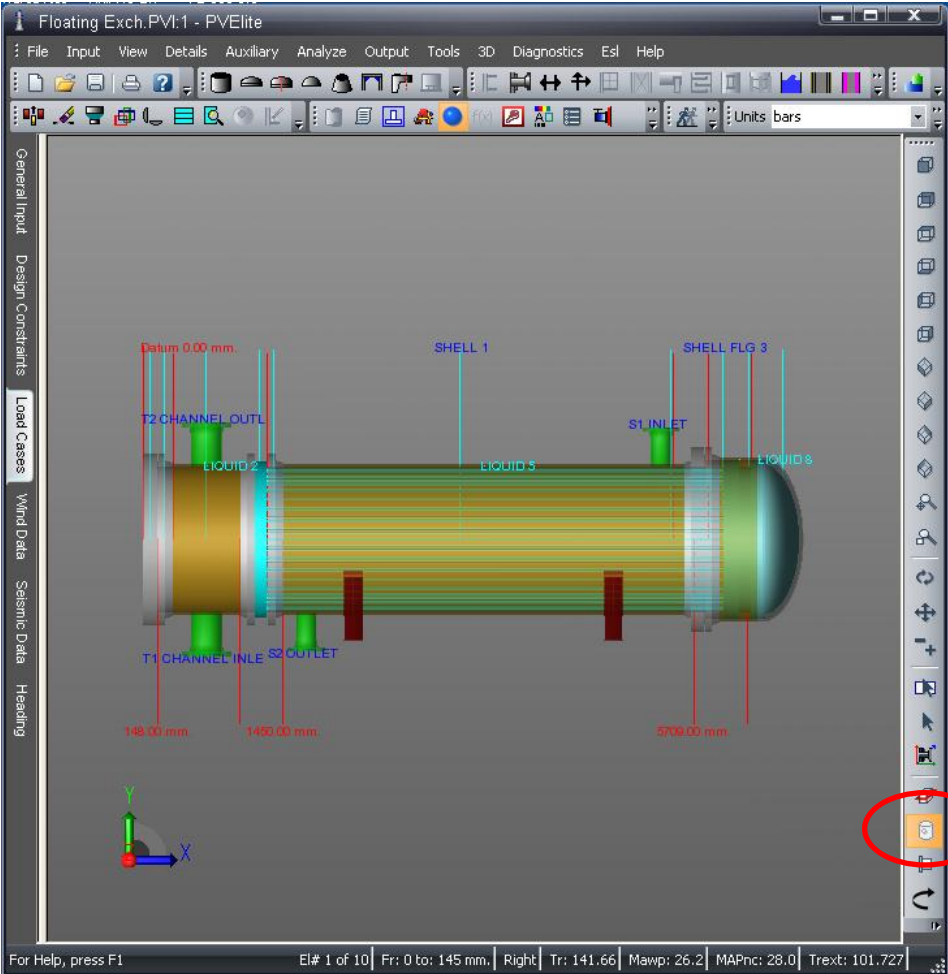
Click on Translate detail icon and click on the nozzle move it.

Translating a nozzle

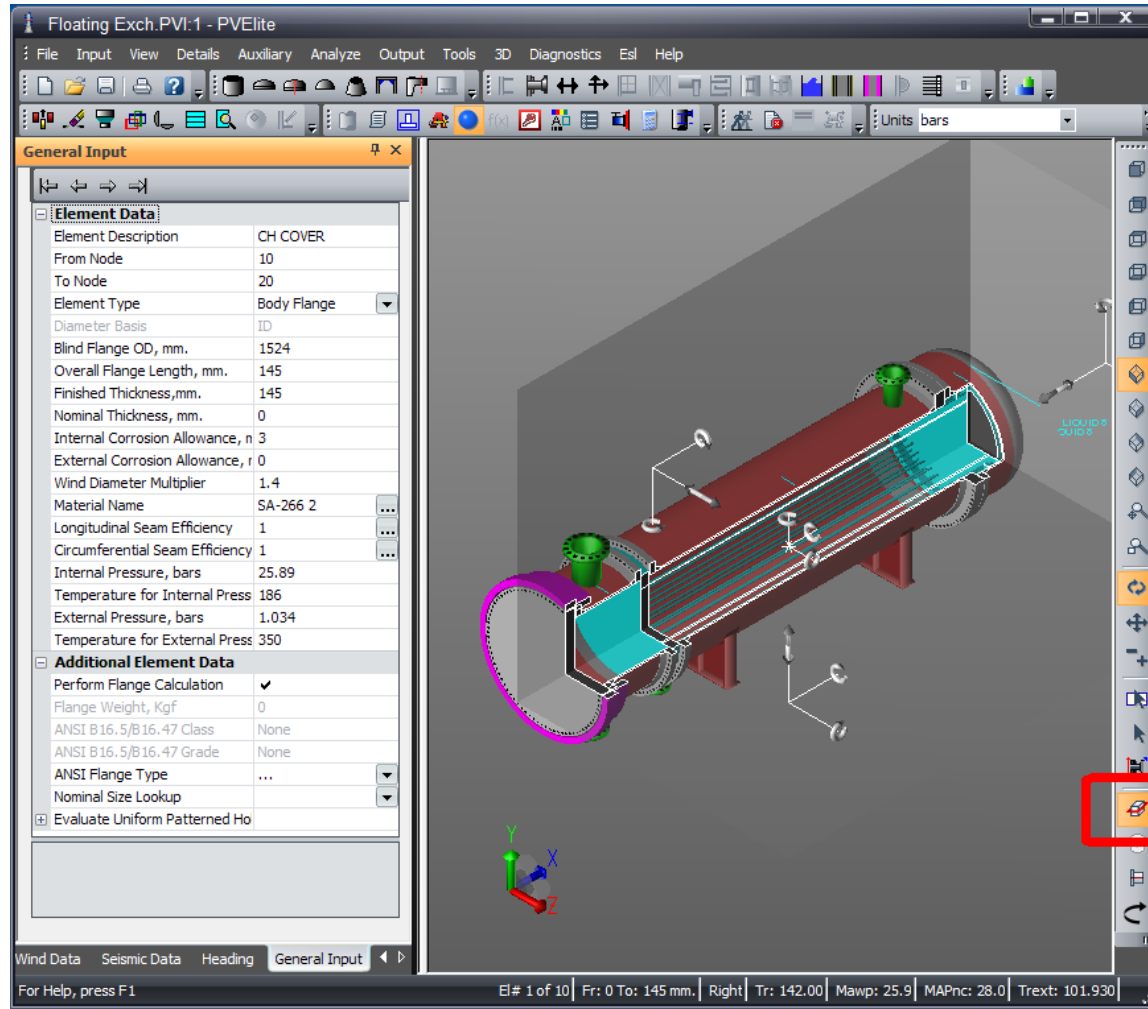


Nozzle moves to new location.

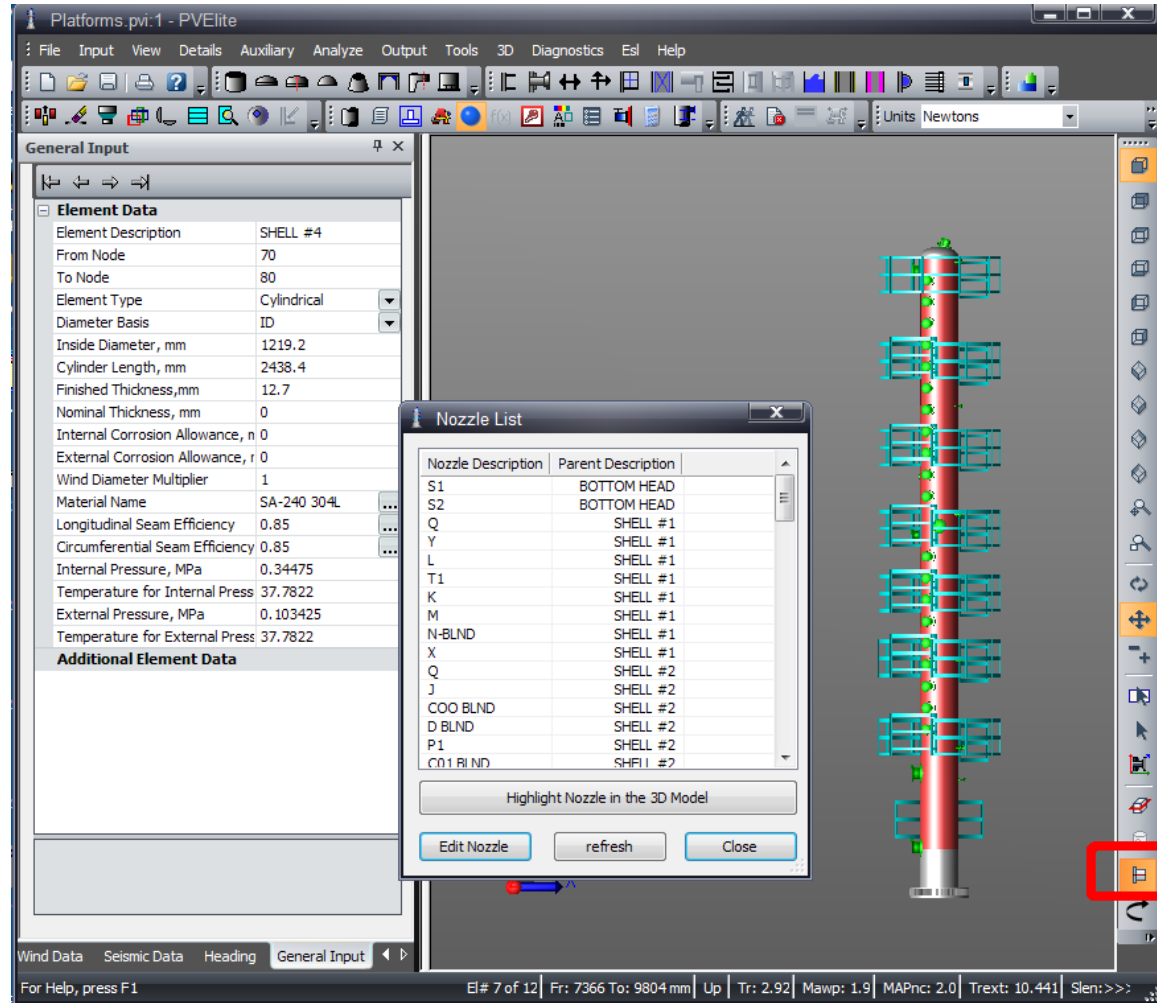
Make 3D model transparent



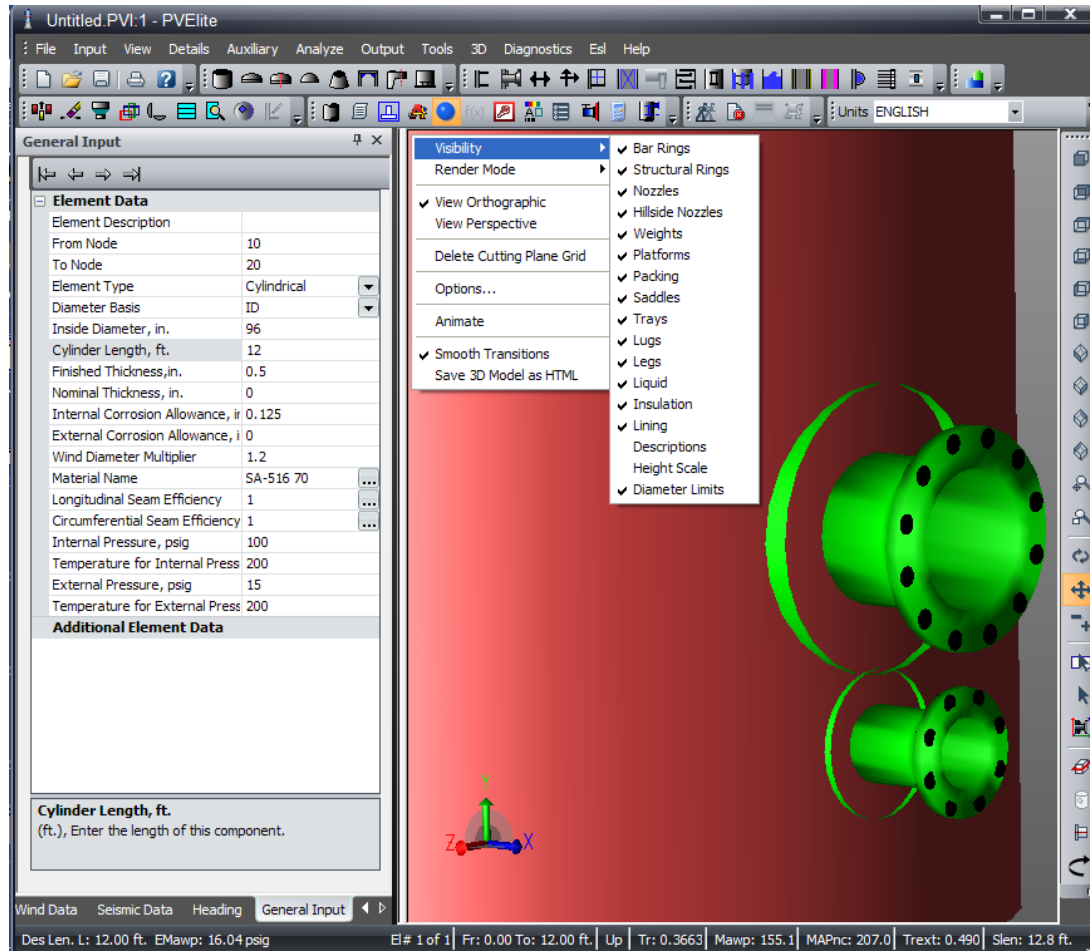
Use Cutting Planes to dissect



Find my Nozzle

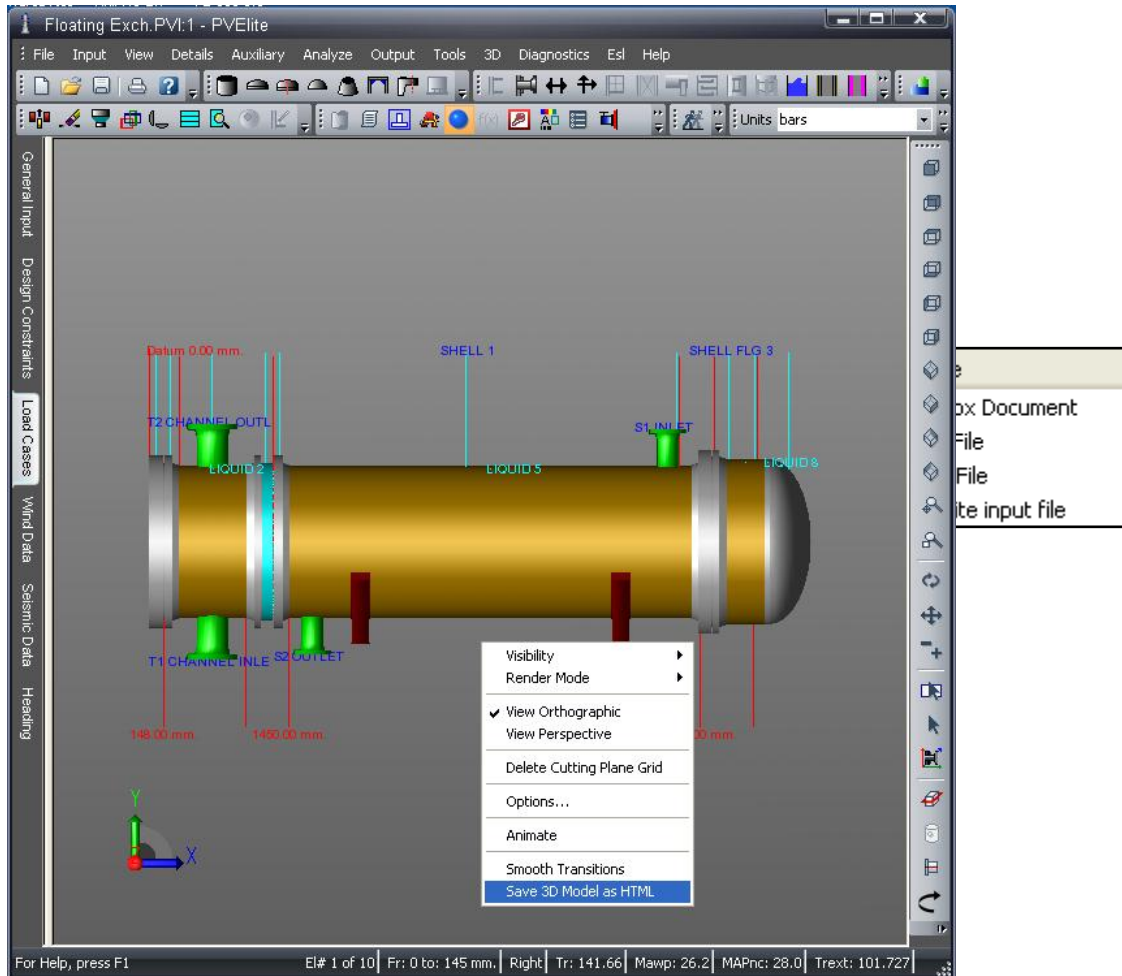


See Nozzle Interference

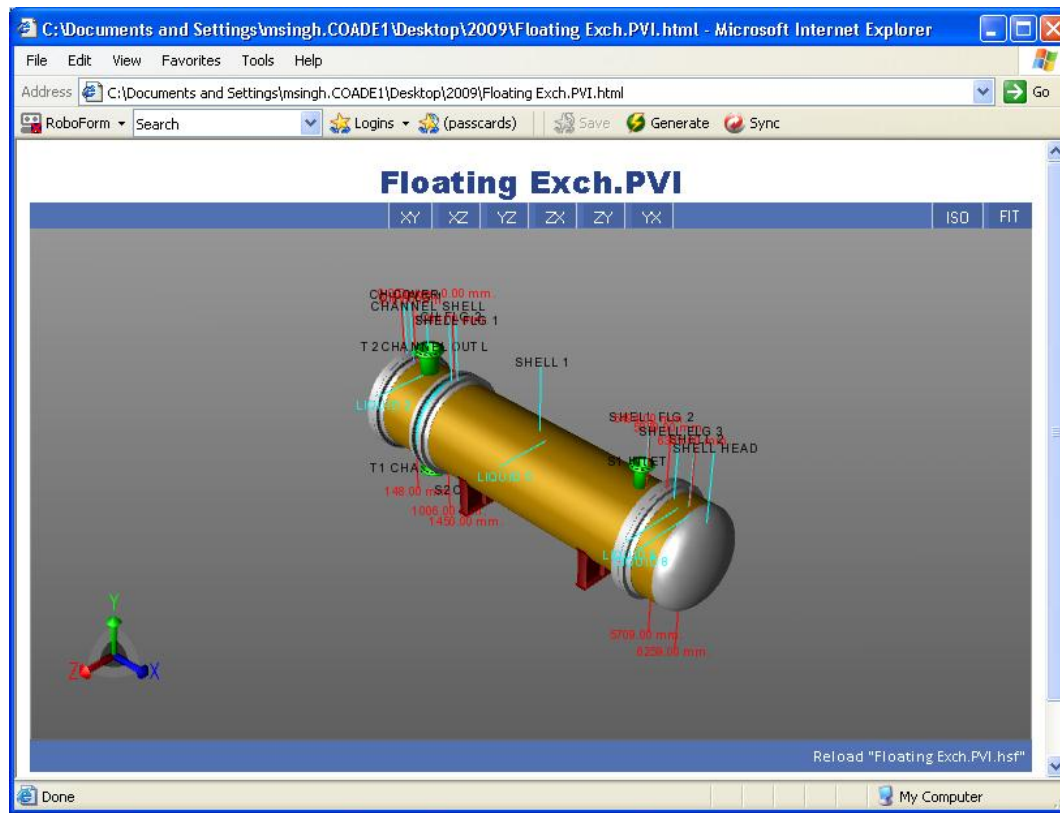


Right click on 3D
or
From "3D" menu.

Share 3D model with customers



- May need to install Viewer from Tech Soft



How to add a Nozzle to a Nozzle

Local Stress Analysis [WRC 107 or Annex G]

Element Elevation Fr: 0.00 To: 10.00 ft.

Nozzle Attachment

Nozzle Description : Child nozzle

Nozzle Material : SA-106 B

Schedule | Diameter : 160 | 2 in.

Dia. Basis | Thickness Basis : ID | Nominal

Corrosion All. | Actual Thk : 0.125 | 0.593 in.

Is this Nozzle Connected to another Nozzle?

Parent Nozzle : N1

Distance from Shell Surface : 0 | 0 ft.

Layout Angle : 0 deg.

Radial Nozzle :

Angled or Lateral Nozzle :

Centerline Tilt Angle : 0 deg.

Cyl./Cone Offset Dimension L : 0 in.

Projection Outside | Inside : 6 | 0 in.

Limits [Diameter | Thickness] : 0 | 0 in.

Overriding Weight : 0 lbm

Pad or Hub Properties

Additional Weld Data

Required

Nozzle to Shell Outside Fillet Weld Leg : 0.375 | 0.217 in.

Nozzle to Shell Inside Fillet Weld Leg : 0 in.

Nozzle to Shell Groove Weld Depth : 0.5 in.

Weld Type : None

Weld Strength OK

Miscellaneous

Flange Class | Grade : 150 | GR 1.1

Flange Material : SA-105

Flange Type : Weld Neck

Neglect Areas : None

Tapped Hole Area Loss : 0 in²

Nozzle Eff. | Shell Eff. : 1 | 1

Local Shell Thk. | User Tr : 0 | 0 in.

Blind Attached?: Manway/Acs Ope ? :

Fatigue Calc ? : Shell Fat Curve : Program Decides

Piping Attached ...

A1: 0.851 A2: 0.234 A3: 0.000 A4: 0.141 A5: 0.000 Aav.: 1.225 Ar: 0.056 [Passed]

Noz: [2 of 2] Previous Nozzle Add New Nozzle Delete Plot... Help

Flange Rating: 260.000 psig

OK Cancel

- Add the Parent nozzle
- Add child nozzle
- Specify its diameter
- Indicate it's a child
- Select its Parent nozzle

How to add a Sump/Boot - 1

Nozzle Input/Analysis: [Boot Nozzle]

Local Stress Analysis [WRC 107 or Annex G] Element Elevation Fr: 0.20 To: 8.20 ft.

Nozzle Attachment

Pad or Hub Properties

Additional Weld Data

Miscellaneous

Layout Angle: 180 deg.

Radial Nozzle:

Centerline Tilt Angle: 0 deg.

Cyl./Cone Offset Dimension L: 0 in.

Projection Outside | Inside: 10 | 0 in.

Limits [Diameter | Thickness]: 0 | 0 in.

Overriding Weight: 0 lbm

Pad Material: SA283-A

Pad Diameter / Width: 14.625 | 3 in.

Pad Thickness: 0.5 in.

Groove Weld Depth: 0.125 in.

Weld Leg at Pad OD: 0.375 | 0.318 in.

Nozzle to Pad Fillet Weld Leg: 0.375 | 0.319 in.

Nozzle to Shell Inside Fillet Weld Leg: 0 in.

Nozzle to Shell Groove Weld Depth: 0.25 in.

Weld Type: None

Weld Strength OK

Flange Class | Grade: None | None

Flange Material: Mat...

Flange Type: None

Neglect Areas: None

Tapped Hole Area Loss: 0 sq in.

Nozzle Eff. | Shell Eff.: 1 | 1

Local Shell Thk. | User Tr: 0 | 0 in.

Blind Attached?: Manway/Acs Ope?:

Fatigue Calc?: Shell Fat Curve: Program Decides

Piping Attached ...

A1: 0.259 A2: 0.465 A3: 0.000 A4: 0.261 A5: 3.000 Aav.: 3.985 Ar: 3.368 [Passed]

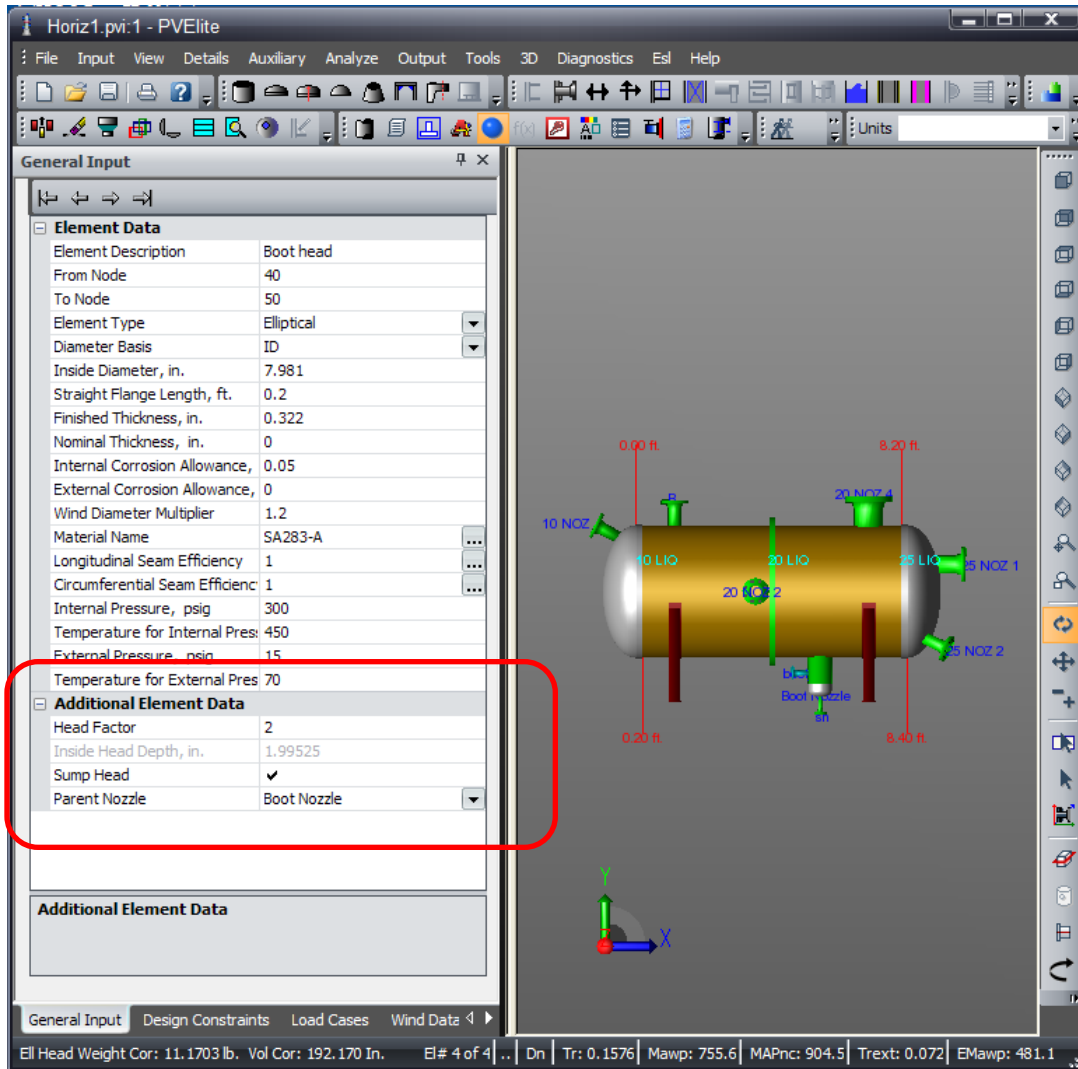
Noz: [3 of 5] Previous Nozzle Goto Next Nozzle Delete Plot... Help

Either: No Flange, Temp > Max Allowed or Data Inconsistent...

OK Cancel

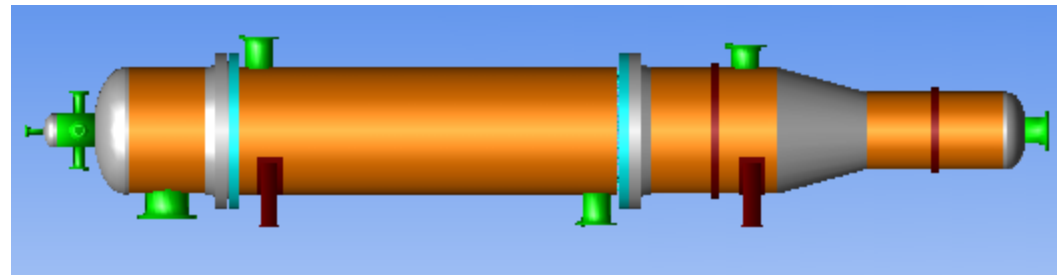
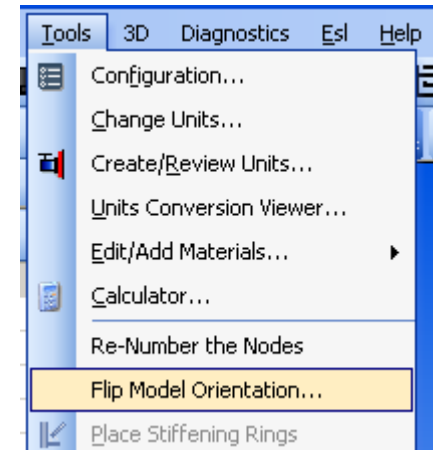
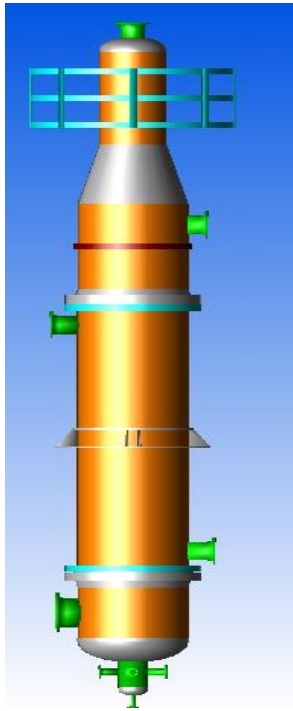
- Add the “boot” as a nozzle
- Select “None” for flange.

How to add a Sump/Boot - 2

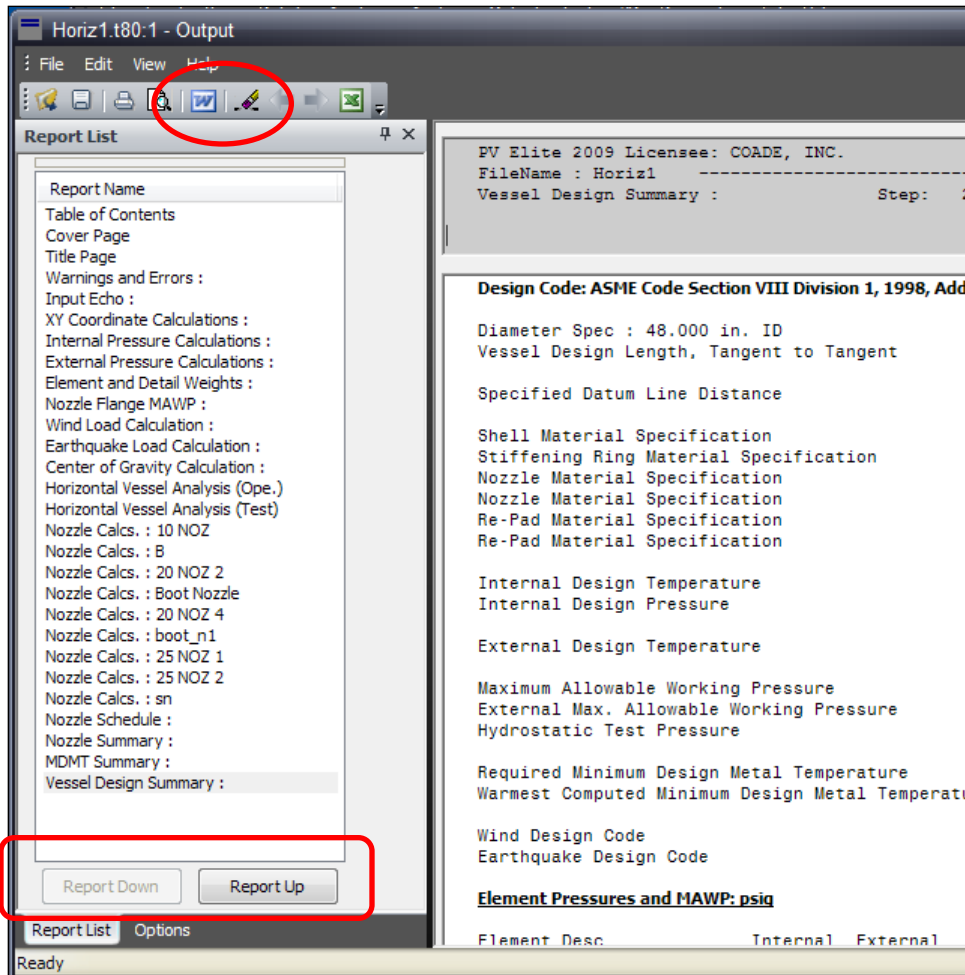


- Now add a head
- Check the box for “Sump Head”
- Connect it to the “boot” nozzle

Flip Vessel for analysis



Output tips - 1



- Export (all or some) reports to MS-Word
- Can re-order Report list.
- Reports can be deleted too

Exporting to ASME U forms

- Export to National Board U forms

Report List

Table of Contents
Cover Page
Title Page
Warnings and Errors :
Input Echo :
XY Coordinate Calculati
Internal Pressure Calcul
External Pressure Calcul
Element and Detail Weig
Nozzle Flange MAWP :
Wind Load Calculation :
Earthquake Load Calcul
Center of Gravity Calcul
Horizontal Vessel Analy
Horizontal Vessel Analy
Nozzle Calcs. : 10 NOZ
Nozzle Calcs. : B
Nozzle Calcs. : 20 NOZ
Nozzle Calcs. : Boot No
Nozzle Calcs. : 20 NOZ
Nozzle Calcs. : boot_n1
Nozzle Calcs. : 25 NOZ
Nozzle Calcs. : 25 NOZ
Nozzle Calcs. : sn
Nozzle Schedule :
Nozzle Summary :
MDMT Summary :
Vessel Design Summary

Report Down

Report List Options

Ready

Import Latest Results Clear Fields Print

Insure all form data is correctly

FORM U-1 MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS
As Required by the Provisions of the ASME Boiler and Pressure Vessel Code Rules, Section VIII, Division 1

1. Manufactured and certified by COADE, Inc.
(Name and address of Manufacturer)

2. Manufactured for XYZ Location
(Name and address of Purchaser)

3. Location of installation Houston, TX
(Name and address)

4. Type Vertical Heat Exchanger 1234
(Horizontal, vertical, or sphere) (Tank, separator, jkt. vessel, heat exch., etc.) (Manufact

N/A A1234 12344 2008
(CRM) (Drwing number) (National Board number) (Year b

5. ASME Code, Section VIII, Div. 1 ASME Section VIII Division 1, 2007
[[Edition and Addends (date)] (Code Case number) [Special servic

Items 6-11 incl. to be completed for a single wall vessels, jackets of the jacketed vessels, shell of heat exchangers, or chamber of mult

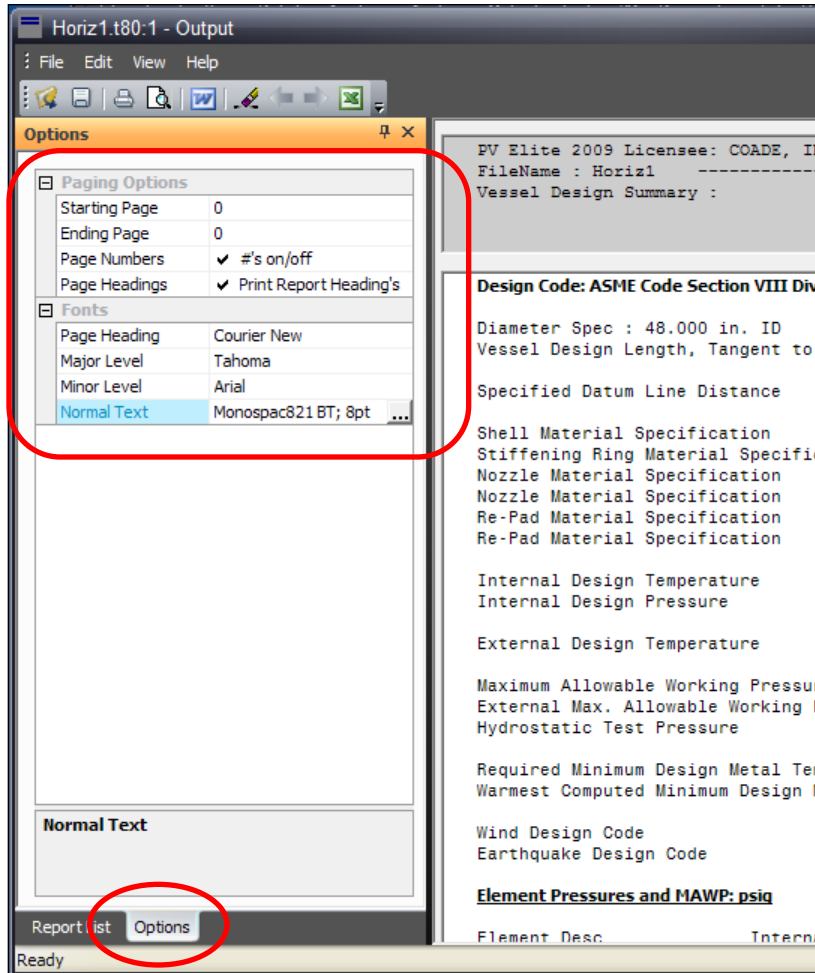
6. Shell: (a) Number of courses 2 (b) Overall length 2000.0 mm

Courses			Material		Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B & C)		
No.	Diameter	Length	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	E	
7	1000.0 mm	1000.0 mm	SA-516 70	8.0 mm	15 mm	1	Full	1.00	1	Full	1.00	

U-1 Page 1 U-1 Page 2 U-4

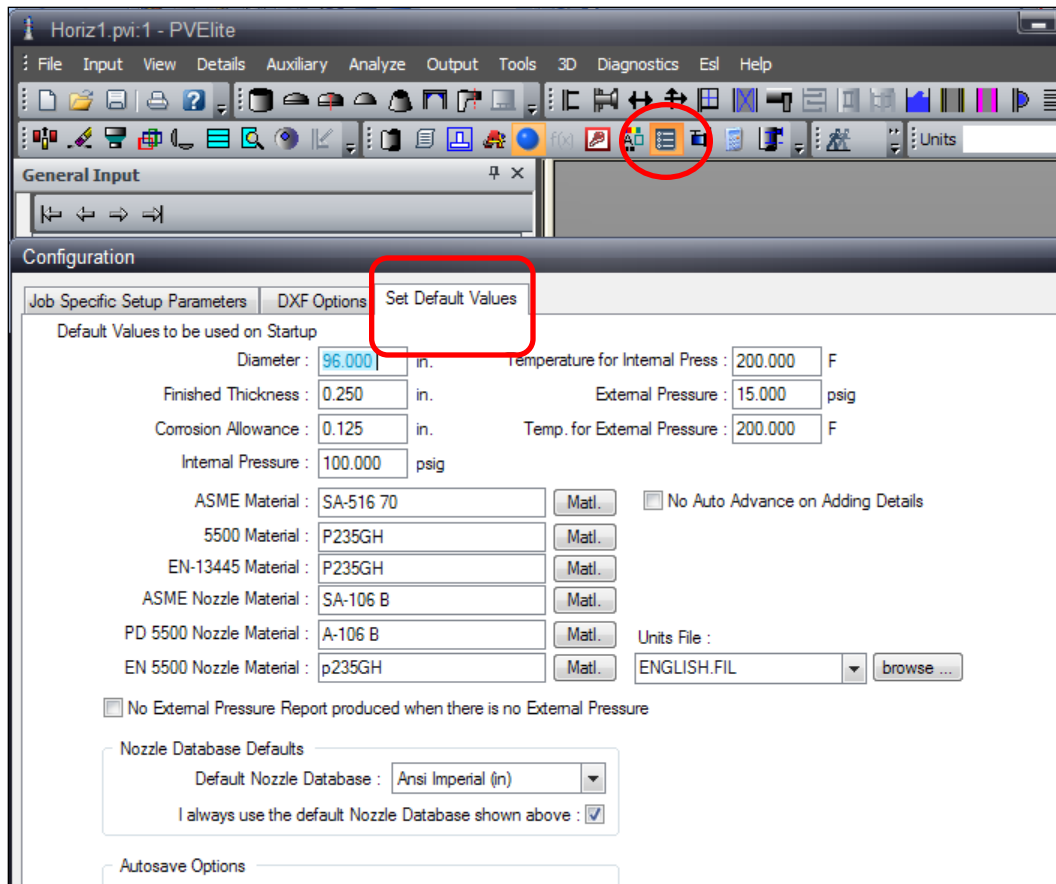
Ready NUM

Output tips – Set font/Other options



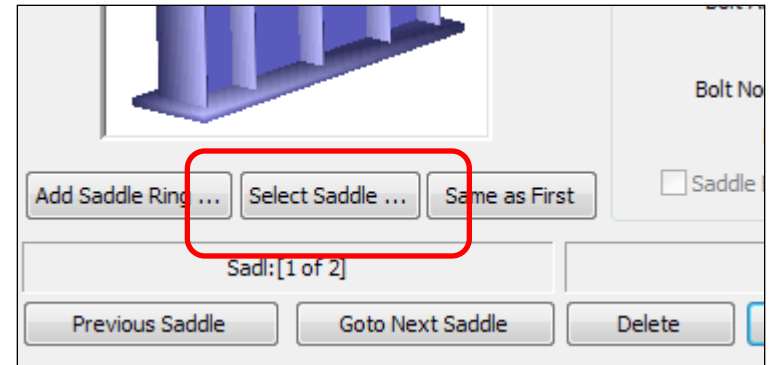
- Select Options tab
- Set font/Page #s

Set some defaults

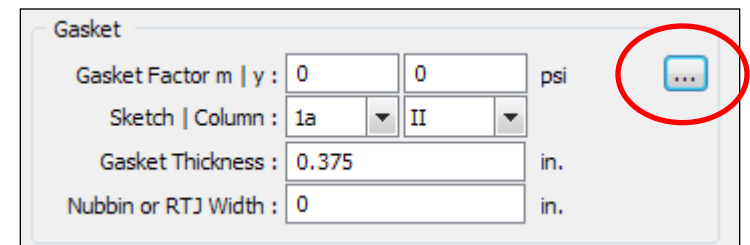


More customization

- Std. Saddle dimensions



- Gasket Properties



That are some of tips/tricks



The End