INTERGRAPH®

2017

Various Templates Creation Option in PV Elite

Fauzan Badiwale

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Agenda

- Templates For Input
  - -Project Template Creation
  - -Custom Saddle data via MS Excel (New Feature of 2017)
- Templates For Analysis
  - -Custom Nozzle data via MS Excel (New Feature of 2017)
- Templates For Output
  - -Title Page Creation In Word report
  - -User Definable 1st Page -3D pdf (New Feature of 2017)
  - -Exporting to ASME U forms
  - -Export to DXF file

Templates For Input

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Project Template Creation

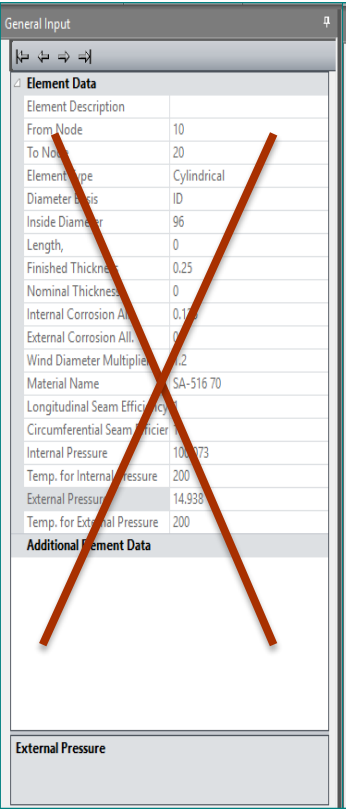
We can set up a Template file of data that we can import into any future model

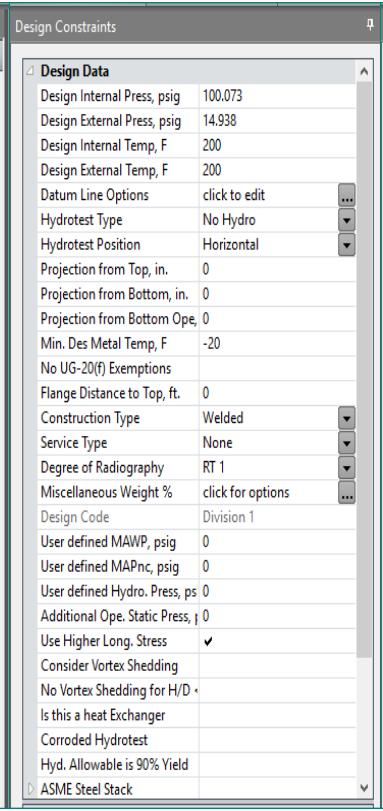
Creating the Template File, these are the steps

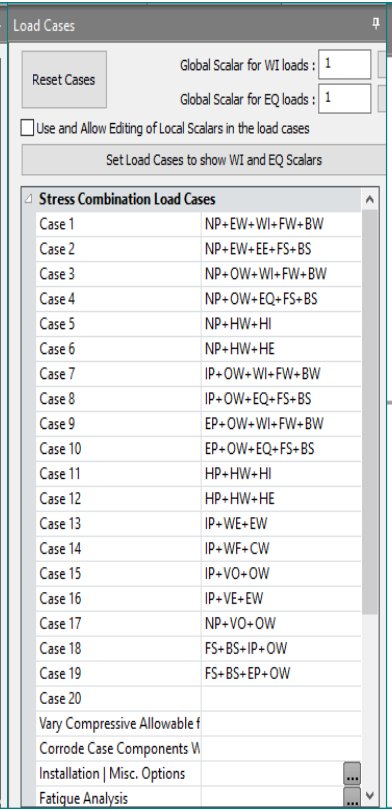
Enter all the data the way you want it for each tab

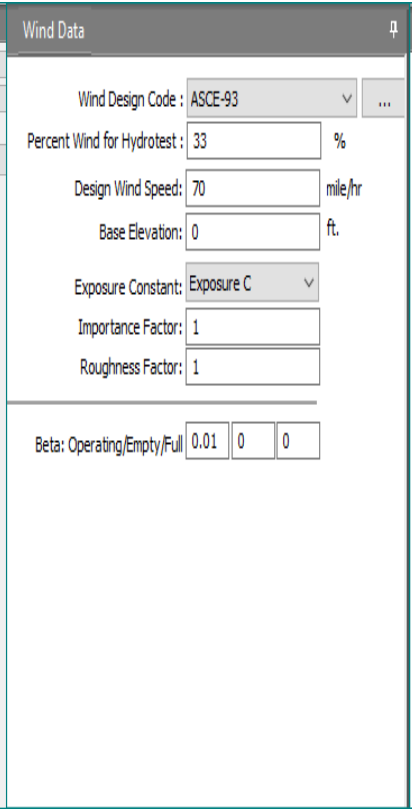
Project Template Creation

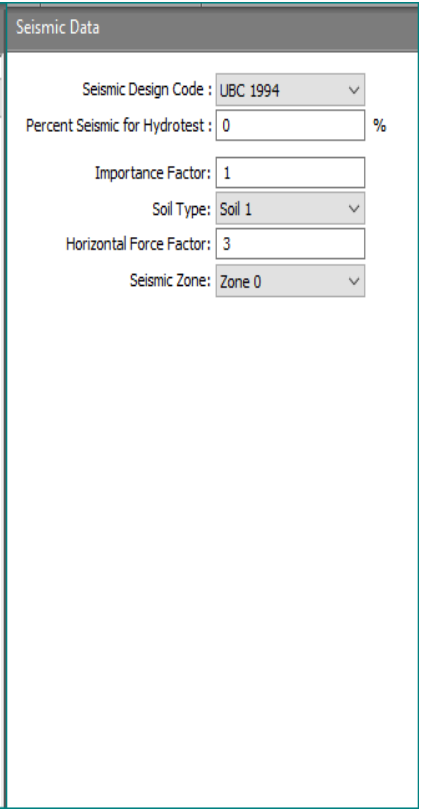
INTERGRAPH











General Input | Design Constraint | Load cases | Wind | Seismic

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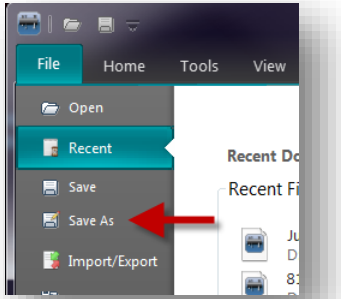
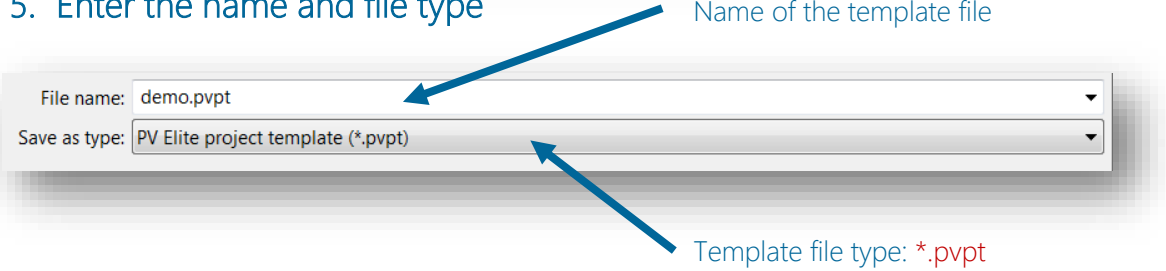
Project Template Creation

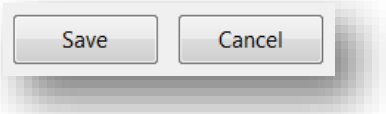
4. Click on Save-As



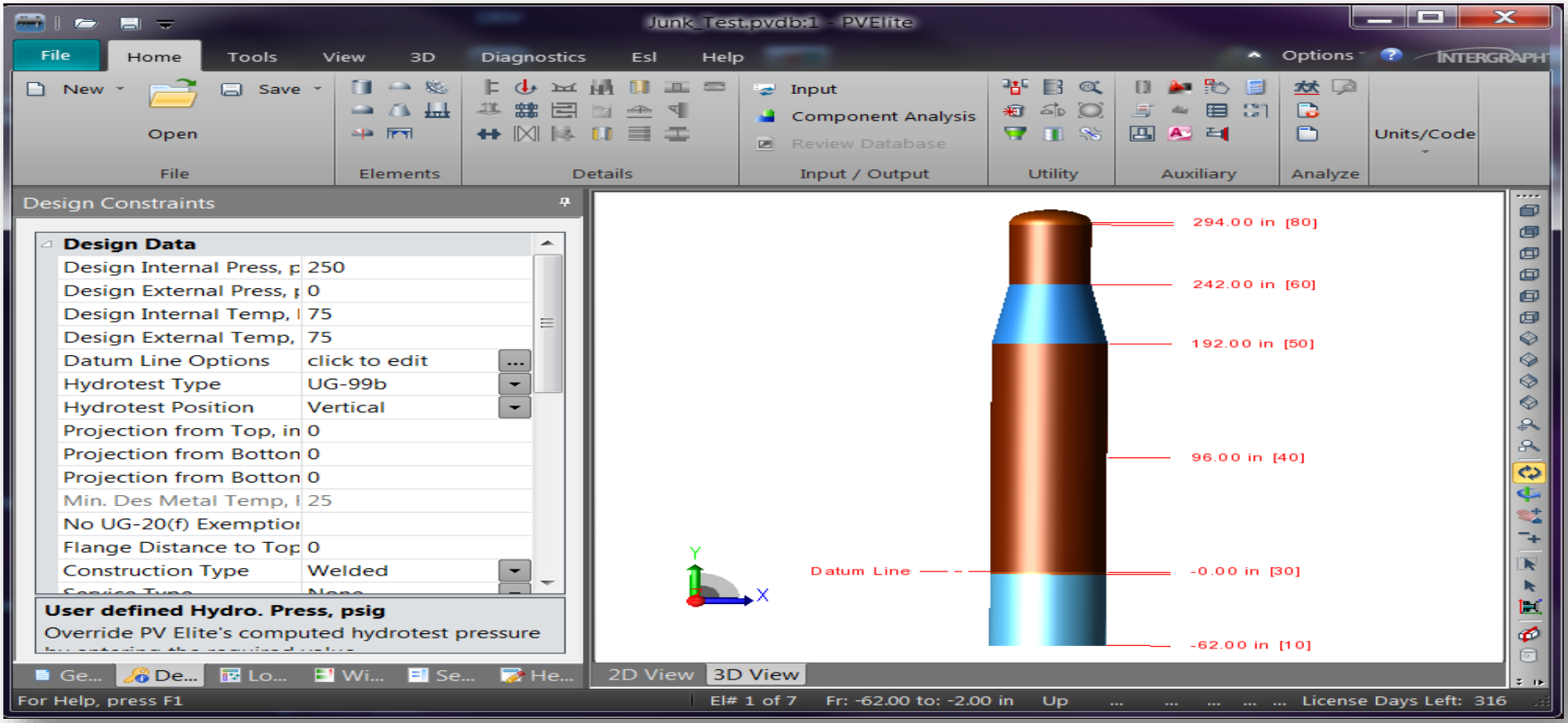
5. Enter the name and file type



6. Click on the Save button



Project Template Creation

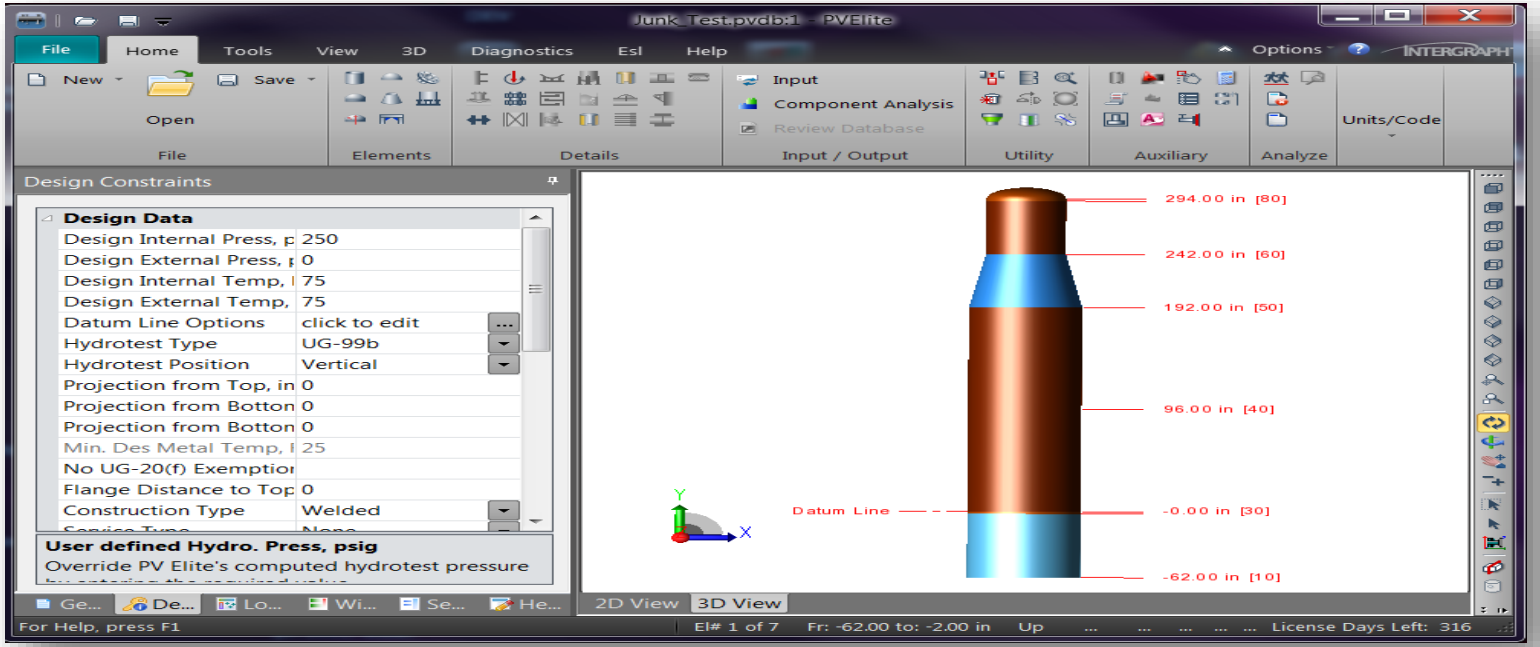


Project Template Creation

You have now successfully saved your template for future use

Now create your file into which you want the template file data

Importing the data from the template file



Now import the data from the template file into this file
Just follow these steps

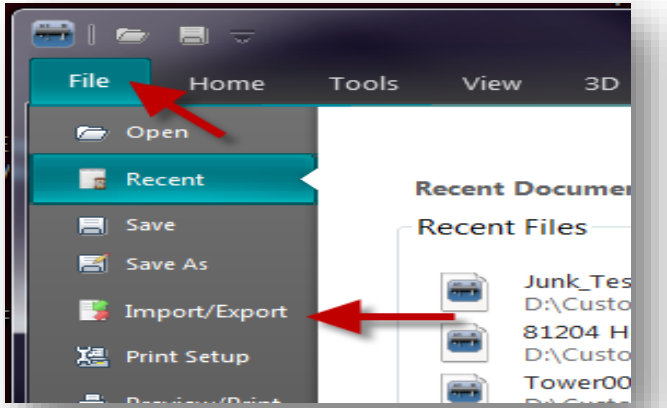
Project Template Creation

You have now successfully saved your template for future use

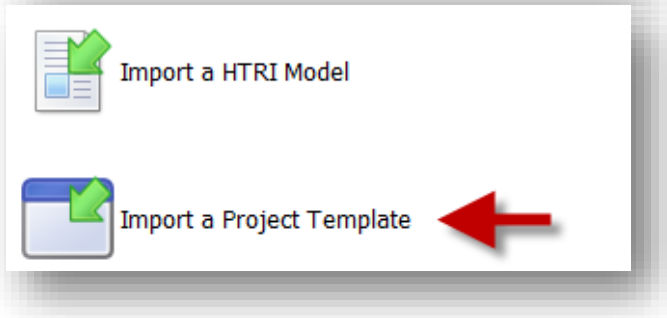
3. You are presented with the Template file

Importing the saved with this template

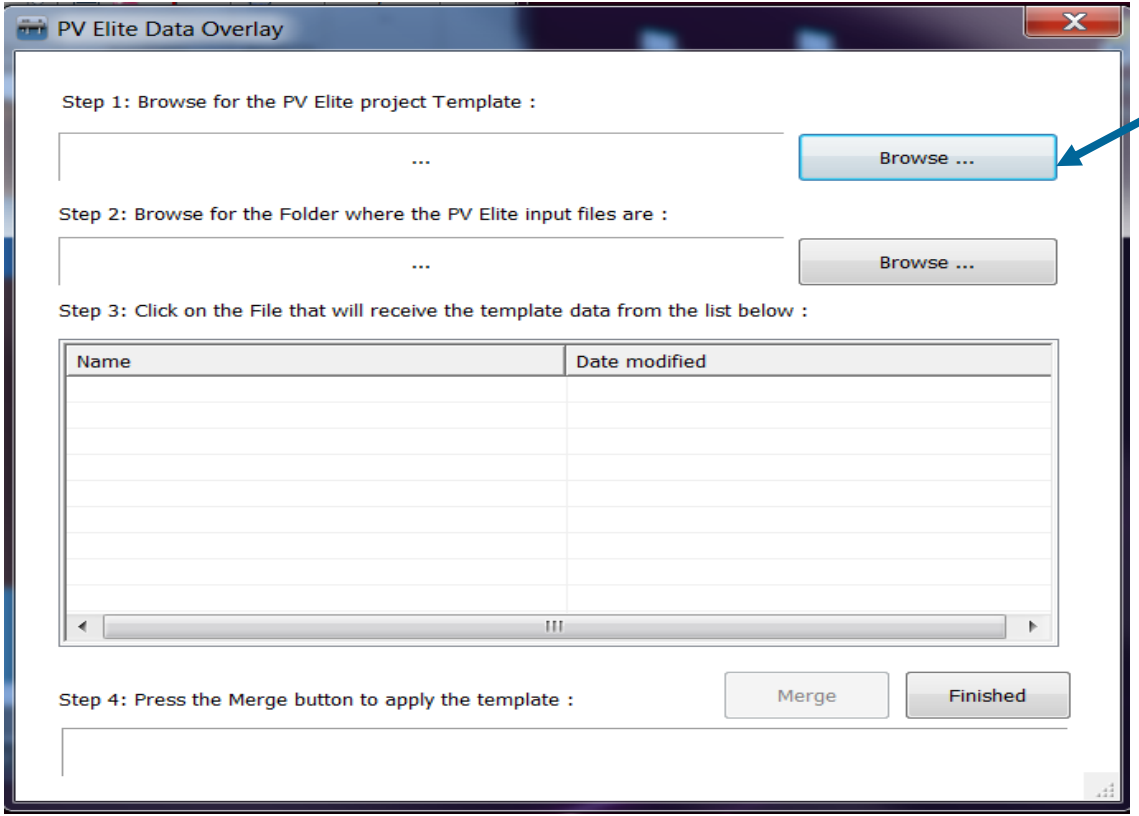
1. Click on file → Import/Export



2. Click on Import a Project Template



Project Template Creation



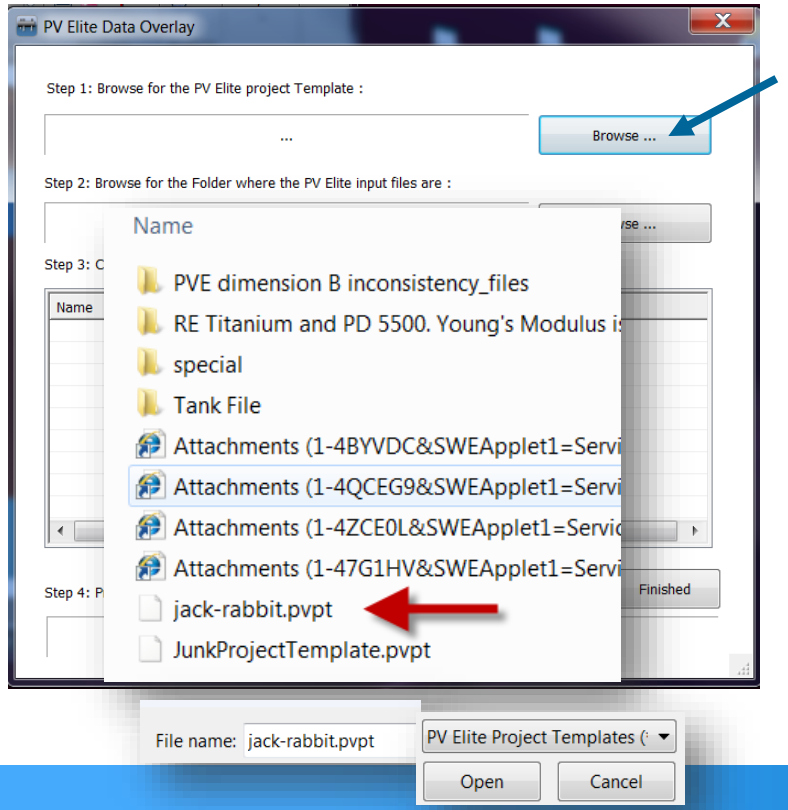
Browse to the Template file

Find the Template file

Project Template Creation

You have now successfully saved your template for future use

3. You are presented with this screen



Browse to the Template file

Find the Template file

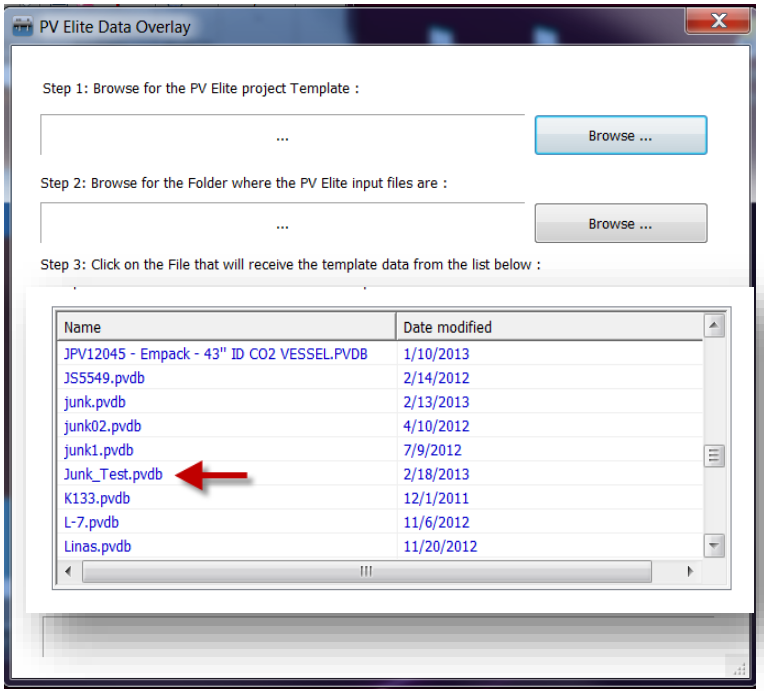
Select the file and Open it

Now Browse to the file into which you would like to import the data

Project Template Creation

You have now successfully saved your template for future use

You are presented with this screen



Find the Template file

Select the file and Open it

Now Browse to the file into which you would like to import the data

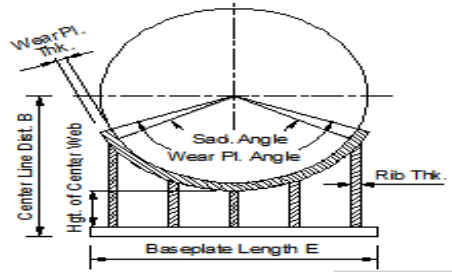
Click the merge button

You have now imported the data into you current model

Easily create and use custom Saddle data via MS Excel

INTERGRAPH

From Node : 20
Detail Description : Lft Sdl
Distance from "From" Node : 2 ft.
Saddle Width | Dimension a : 8 | 26 in.
Centerline Dimension B : 72 in.
Saddle Contact Angle : 120 deg.
Wear Plate Width | Thickness : 12 | 0.375 in.
Wear Plate Contact Angle : 132 deg.
Height of Section Ring : 0 in.
Friction Coefficient Mu : 0
Moment Factor, Ftr : 3
Dimension E at Base (optional) : 0 in.
Tangent to Tangent Distance (optional) : 0 ft.
Circumferential Eff. Over Saddle | At Midspan : 1 | 1
Wear Plate and Shell Materials are the Same ? ☐
Is this Saddle Welded to the Shell ? ☑



Add Saddle Ring ... | Select Saddle | Sadl:[1 of 1] | Previous Saddle | Add

--- Make a Selection ---
Moss
imagegrafix
Project ABC
sample

Perform Saddle Check ?
Saddle Allowable Stress : 13800 psi Matl...
Material Yield Stress : 34800 psi
E for Plates : 2.9e+007 psi
Baseplate Length | Thickness : 86.221 | 1 in.
Baseplate Width : 10 in.
Number of Ribs : 5
Rib Thickness | Web Thickness : 0.375 | 0.375 in.
Height of Web at Center : 12 in.
Web Location : Center

☐ Perform Anchor Bolt Calculations ?

☐ Saddle Bolted to Steel Foundation?
Number of Bolts : 8
Num of Bolts in Tension : 4
Edge Distance : 2 in.
Bolt Corrosion Allowance : 0 in.
Bolt Material : SA-193 B7 Matl:
Bolt Allowable Stress : 25000 psi
Thread Series : Tema
Bolt Nominal Diameter : 0 in. ...
Bolt Root Area : in²

Optional Moments for Saddle Analysis

	Operating	Test	
Moment M1 or M3 (optional) :	0	0	ft.lb.
Moment M2 or M4 (optional) :	0	0	

... | Delete | OK | Cancel | Help

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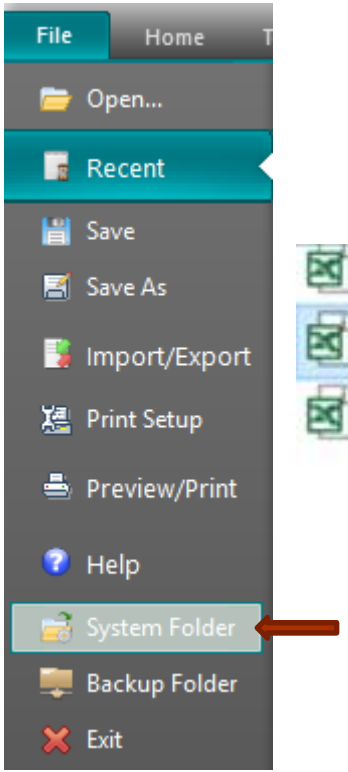
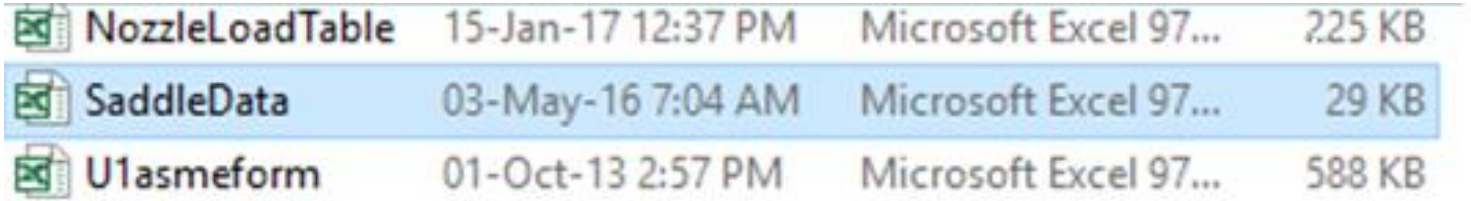
Easily create and use custom Saddle data via MS Excel





Easily create and use custom Saddle data via MS Excel

INTERGRAPH

Vessel Ou	Baseplate Length	Centerline	Saddle Width	Contact Angle	Plate Width	Wear Plate Thk.	Plate Angle	Baseplate Thk.	Baseplat e Width	Number of Ribs	Rib Thk
in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.000	8.000	10.000	4.000	90.000	6.000	0.375	132.000	0.500	4.000	3.000	0.250
24.000	22.000	21.000	4.000	122.000	6.000	0.375	132.000	0.500	4.000	4.000	0.250
30.000	27.000	24.000	4.000	120.000	6.000	0.375	130.000	0.500	4.000	4.000	0.250
36.000	33.000	27.000	6.000	125.000	8.000	0.500	135.000	0.500	6.000	4.000	0.250
42.000	38.000	30.000	6.000	123.000	8.000	0.500	133.000	0.500	6.000	4.000	0.250
48.000	44.000	33.000	6.000	127.000	8.000	0.500	137.000	0.500	6.000	4.000	0.250
54.000	48.000	36.000	6.000	121.000	8.000	0.500	131.000	0.500	6.000	4.000	0.250
60.000	54.000	39.000	6.000	124.000	8.000	0.500	134.000	0.500	6.000	4.000	0.250
66.000	60.000	42.000	6.000	127.000	8.000	0.500	137.000	0.500	6.000	4.000	0.250
72.000	64.000	45.000	6.000	122.000	8.000	0.500	132.000	0.500	6.000	4.000	0.375
78.000	70.000	48.000	8.000	124.000	10.000	0.500	134.000	0.750	8.000	5.000	0.375
84.000	74.000	51.000	8.000	121.000	10.000	0.500	131.000	0.750	8.000	5.000	0.375
90.000	80.000	54.000	8.000	123.000	10.000	0.500	133.000	0.750	8.000	5.000	0.375
96.000	86.000	57.000	8.000	125.000	10.000	0.500	135.000	0.750	8.000	5.000	0.375
102.000	92.000	60.000	10.000	126.000	12.000	0.625	136.000	0.750	10.000	5.000	0.500
108.000	96.000	63.000	10.000	123.000	12.000	0.625	133.000	0.750	10.000	5.000	0.500
114.000	102.000	66.000	10.000	125.000	12.000	0.625	135.000	0.750	10.000	5.000	0.625
120.000	106.000	69.000	10.000	122.000	12.000	0.625	132.000	0.750	10.000	5.000	0.625
132.000	118.000	75.000	10.000	125.000	12.000	0.625	135.000	0.750	10.000	5.000	0.625
144.000	128.000	81.000	10.000	124.000	12.000	0.625	134.000	0.750	10.000	5.000	0.625
156.000	140.000	87.000	10.000	126.000	12.000	0.625	136.000	0.750	10.000	5.000	0.625
160.000	140.000	87.000	10.000	126.000	12.000	0.625	136.000	0.750	10.000	5.000	0.625

Instructions | Moss | imagegrafix | Project ABC | **sample**

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Templates For Analysis

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Easily create and use custom Nozzle data via MS Excel

INTERGRAPH

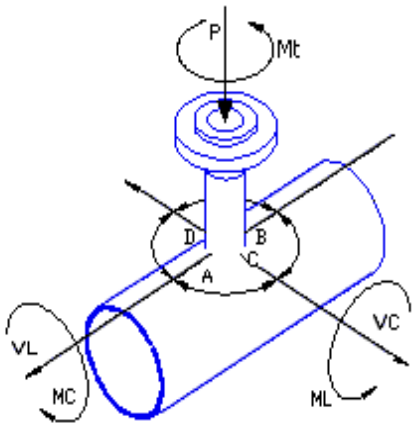
Nozzle Input/Analysis: [Noz N1 Fr20]

Nozzle Main | Local Stress Analysis [WRC 107, 297 or Annex G]

Calculation Method: WRC 107

Load Convention System: (•) Local ( ) Global

	Sustained	Expansion	Occasional	
Radial force P :	0	0	0	lb.
Circ. shear force Vc :	0	0	0	
Long. shear force Vl :	0	0	0	
Circ. moment Mc:	0	0	0	ft.lb.
Long. moment Ml:	0	0	0	
Torsional moment Mt:	0			



--- Make a Selection ---
Project A Loadings
Australian User Loadings
Project B Loadings

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

Use WRC 368 :

t Radius
Nozzle: 0
Pad: 0

Direction Cosines
Vessel :
VX : 0

Easily create and use custom Nozzle data via MS Excel

INTERGRAPH

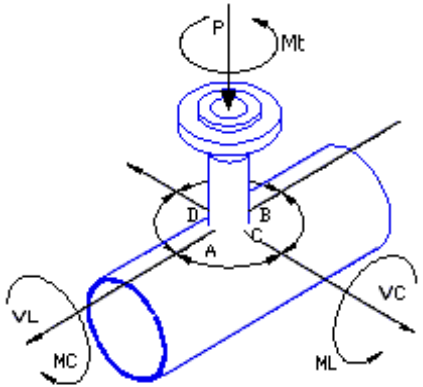
Nozzle Input/Analysis: [Noz N1 Fr30]

Nozzle Main | Local Stress Analysis [WRC 107, 297 or Annex G]

Calculation Method: WRC 107

Load Convention System: (•) Local ( ) Global

	Sustained	Expansion	Occasional	
Radial force P :	0	0	0	lb.
Circ. shear force Vc :	0	0	0	
Long. shear force Vl :	0	0	0	
Circ. moment Mc:	0	0	0	ft.lb.
Long. moment Ml:	0	0	0	
Torsional moment Mt:	0			



--- Make a Selection ---
project B loading
project C loading
Project A Loadings
Australian User Loadings
EN-User Loadings

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

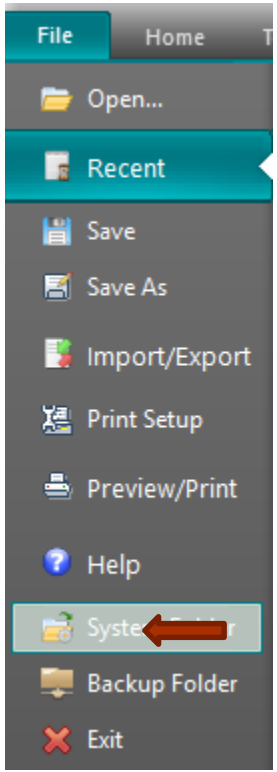
Fillet Radius
Nozzle: 0
Pad: 0

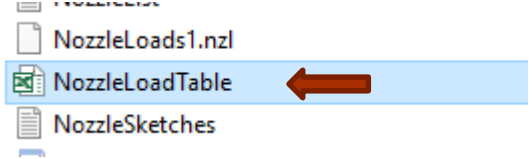
Direction Cosines
Vessel :
VX : 0
VY : 0
VZ : 0

Stress Concentration Factors

Allowable Stress Intensity factors at Pad Edge

Easily create and use custom Nozzle data via MS Excel





20	18	450	1305	1305	1846	2152	2152	3039
21	20	500	1479	1479	2060	2570	2570	3630
22	22	550	1652	1652	2335	3018	3018	4262
23	24	600	1825	1825	2580	3447	3447	4864
24	26	650	2009	2009	2865	3855	3855	5445
25	28	700	2182	2182	3080	4283	4283	6047
26	30	750	2365	2365	3314	4701	4701	6649
27	32	800	2570	2570	3630	5425	5425	7578
28	34	850	2774	2774	3916	6016	6016	8515
29	36	900	2978	2978	4201	6638	6638	9392
30	38	950	3192	3192	4497	7291	7291	10309
31	40	1000	3396	3396	4803	7964	7964	11258
32	42	1050	3620	3620	5108	8668	8668	12257
33	44	1100	3884	3884	5415	9392	9392	13287
34	46	1150	4069	4069	5731	10156	10156	14368
35	48	1200	4293	4293	6057	10942	10942	15479
36	50	1250	4528	4528	6394	11757	11757	16632
37	52	1300	4772	4772	6720	12604	12604	17825
38	54	1350	5017	5017	7067	13471	13471	19039
39	56	1400	5262	5262	7413	14368	14368	20333
40	58	1450	5517	5517	7770	15298	15298	21649
41	60	1500	5772	5772	8127	16254	16254	22995
42								
43	[300]							
44	;		Force in Kgf			Moment in Kgf-m		
45	;NPS	DN	Vl	Vo	P	Ml	Mo	Mt
46	2	50	112	112	153	20	20	31

Instructions | project B loading | project C loading | Project A Loadings | Australian User Loadings | EN-User Loadings ...

Templates For Output

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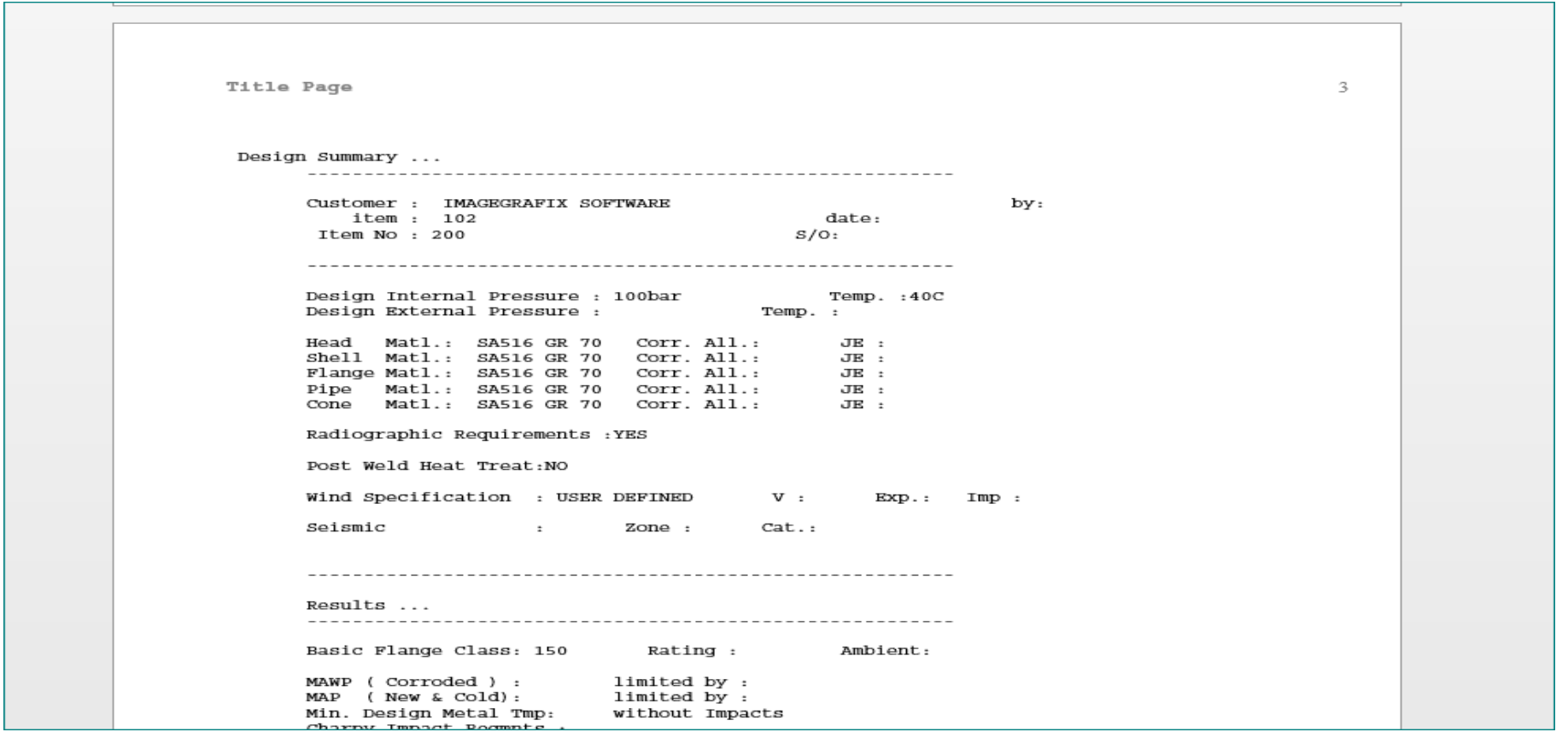
Title Page Creation In Word report



Title Page 3

Design Summary ...

Customer : IMAGEGRAFIX SOFTWARE by:
item : 102 date:
Item No : 200 S/O:

Design Internal Pressure : 100bar Temp. :40C
Design External Pressure : Temp. :

Head Matl.: SA516 GR 70 Corr. All.: JE :
Shell Matl.: SA516 GR 70 Corr. All.: JE :
Flange Matl.: SA516 GR 70 Corr. All.: JE :
Pipe Matl.: SA516 GR 70 Corr. All.: JE :
Cone Matl.: SA516 GR 70 Corr. All.: JE :

Radiographic Requirements :YES

Post Weld Heat Treat:NO

Wind Specification : USER DEFINED V : Exp.: Imp :

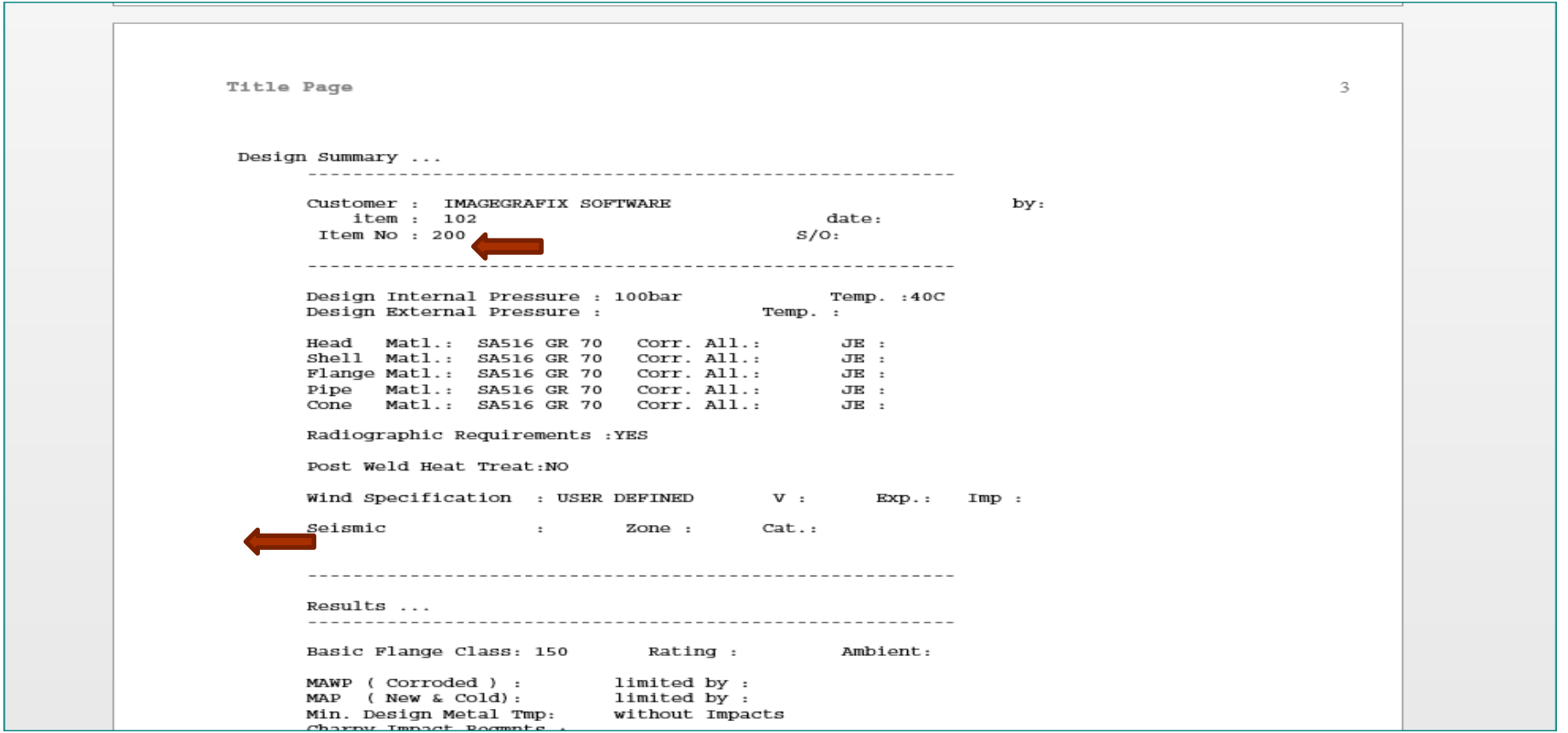
Seismic : Zone : Cat.:

Results ...

Basic Flange Class: 150 Rating : Ambient:

MAWP (Corroded) : limited by :
MAP (New & Cold): limited by :
Min. Design Metal Tmp: without Impacts
Charpy Impact Reqmnts :

Title Page Creation In Word report



Title Page 3

Design Summary ...

Customer : IMAGEGRAFIX SOFTWARE by:
item : 102 date:
Item No : 200 S/O:

Design Internal Pressure : 100bar Temp. :40C
Design External Pressure : Temp. :

Head Matl.: SA516 GR 70 Corr. All.: JE :
Shell Matl.: SA516 GR 70 Corr. All.: JE :
Flange Matl.: SA516 GR 70 Corr. All.: JE :
Pipe Matl.: SA516 GR 70 Corr. All.: JE :
Cone Matl.: SA516 GR 70 Corr. All.: JE :

Radiographic Requirements :YES

Post Weld Heat Treat:NO

Wind Specification : USER DEFINED V : Exp.: Imp :

Seismic : Zone : Cat.:

Results ...

Basic Flange Class: 150 Rating : Ambient:

MAWP (Corroded) : limited by :
MAP (New & Cold): limited by :
Min. Design Metal Tmp: without Impacts
Charpy Impact Reqmnts :

User Definable 1st Page

- Global project page (system folder)

C:\Users\Public\Documents\Intergraph CAS\PVElite\2017\system

Report

- Local project page for each project (local folder)

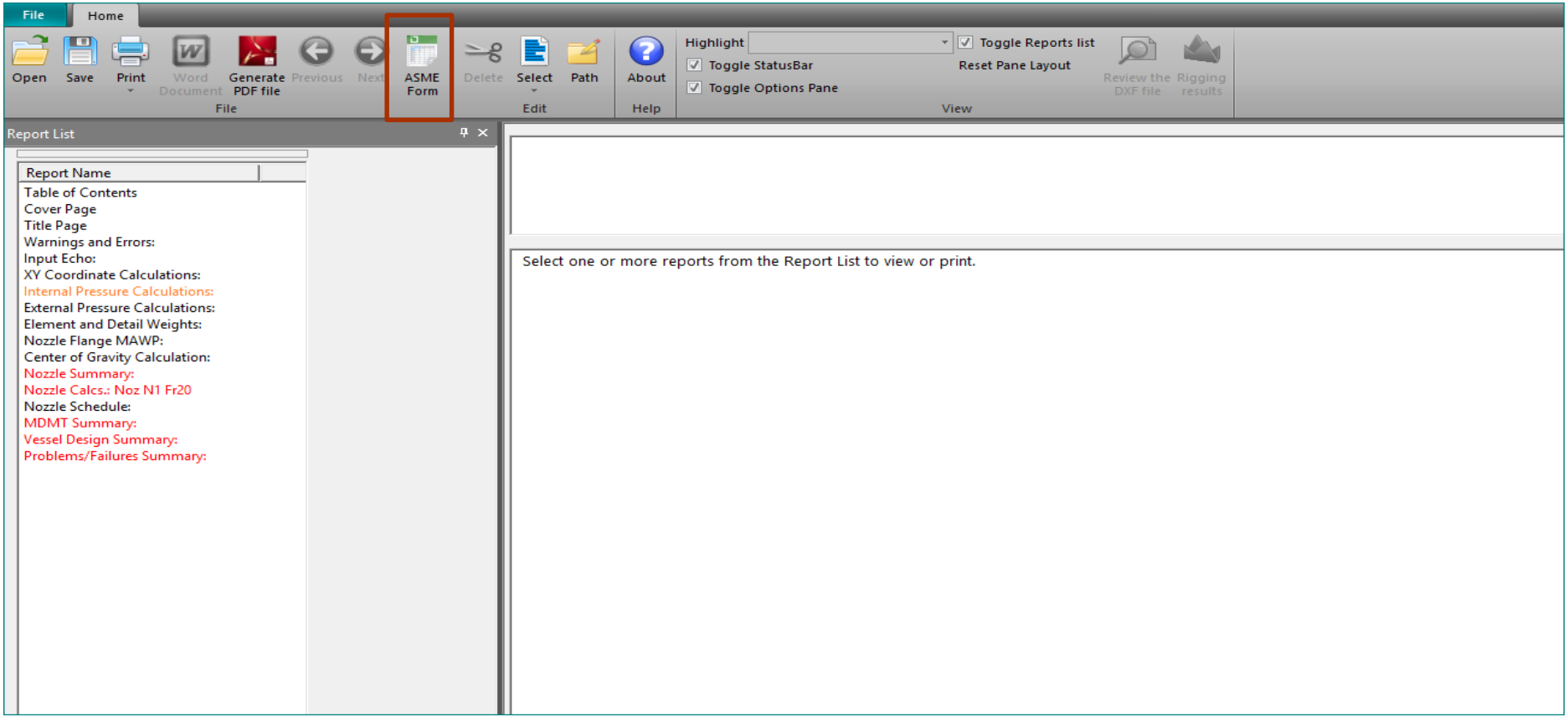
Title_Page.docx	11/10/2016 5:06 PM	Microsoft Word Document	186 KB
Title_Page.pdf	11/10/2016 5:06 PM	Adobe Acrobat Document	124 KB

ImageGrafix

Title Page:-

TITLE OF DOCUMENT	DESIGN CODE CALCULATTION
PROJECT	IMAGEGRAFIX PRESSURE VESSEL
ENDCLIENT	IMAGEGRAFIX SOFTWARE FZCO
MANUFACTURER	IMAGEGRAFIX SOFTWARE FZCO
EQUIPMENT DESCRIPTION	VERTICAL PRESSURE VESSEL
EQUIPMENT TAG NO.	V-110-A/B/C/D-1 NOS
MANUFACTURE'S DRG. NO.	MARCH 2017
AUTHORIZE INSPECTION	IMAGEGRAFIX SOFTWARE FZCO

Exporting to ASME U forms



Exporting to ASME U forms

INTERGRAPH

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 IMAGEGRAFIX SOFTWARE
   (Name and address of Manufacturer)
2. Manufactured for IMAGEGRAFIX SOFTWARE
   (Name and address of Purchaser)
3. Location of installation XYZ
   (Name and address)
4. Type Vertical (Horizontal, vertical, or sphere) Distillation Column (Tank, separator, jkt. vessel, heat exch., etc.) IMAGEGRAFIX (Manufacturer's serial number)

   N/A (CRN) 06-03-2017 (Drawing number) 2017 (National Board number) 2017 (Year built)
5. ASME Code, Section VIII, Div. 1 2015 [Edition and Addenda, if applicable (date)] 2193 (Code Case number) [Special service per UG-120(d)]

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

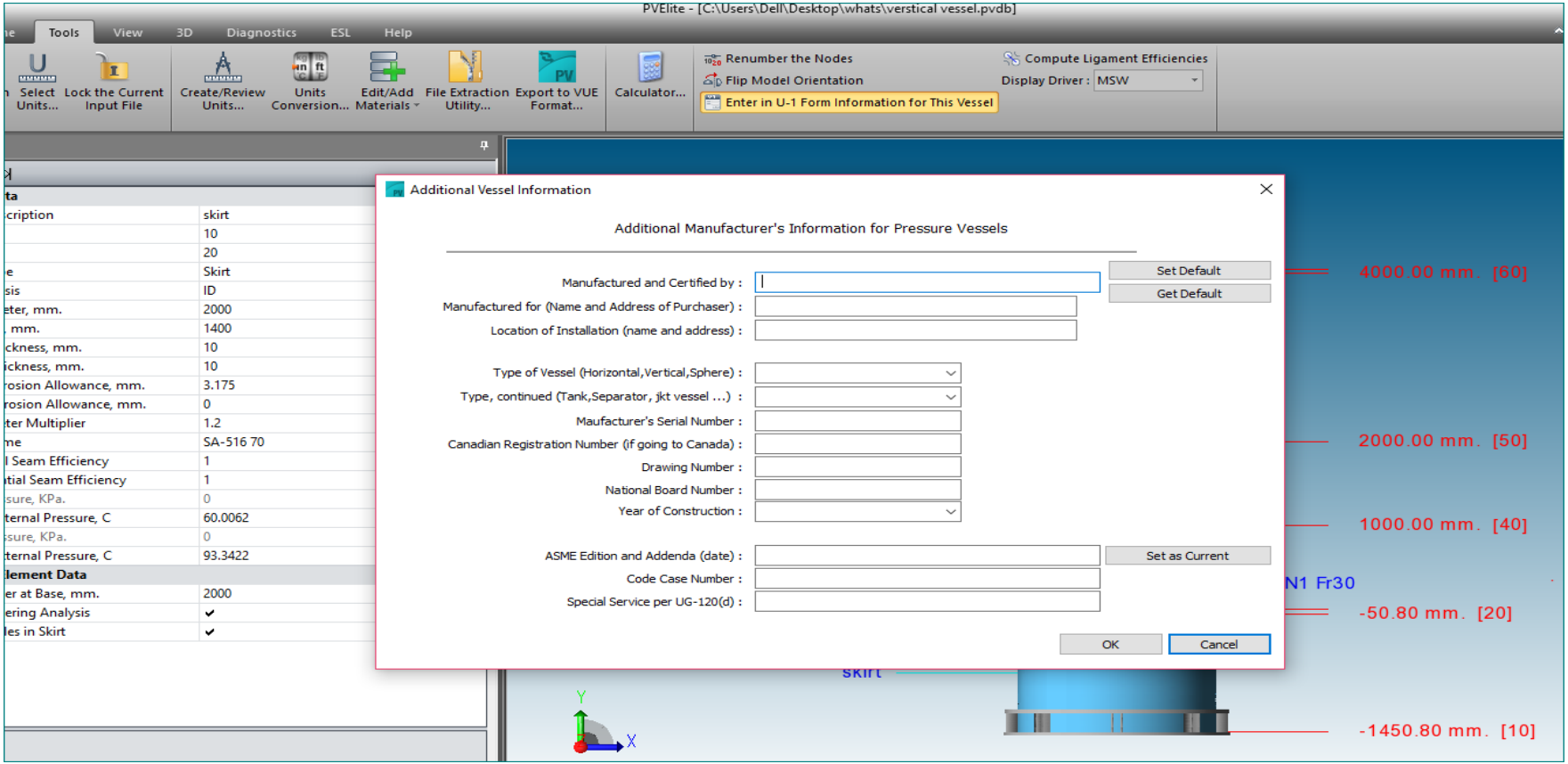
6. Shell: (a) Number of course(s) 1 (b) Overall length 16.14 ft.

70-80% Completed Forms

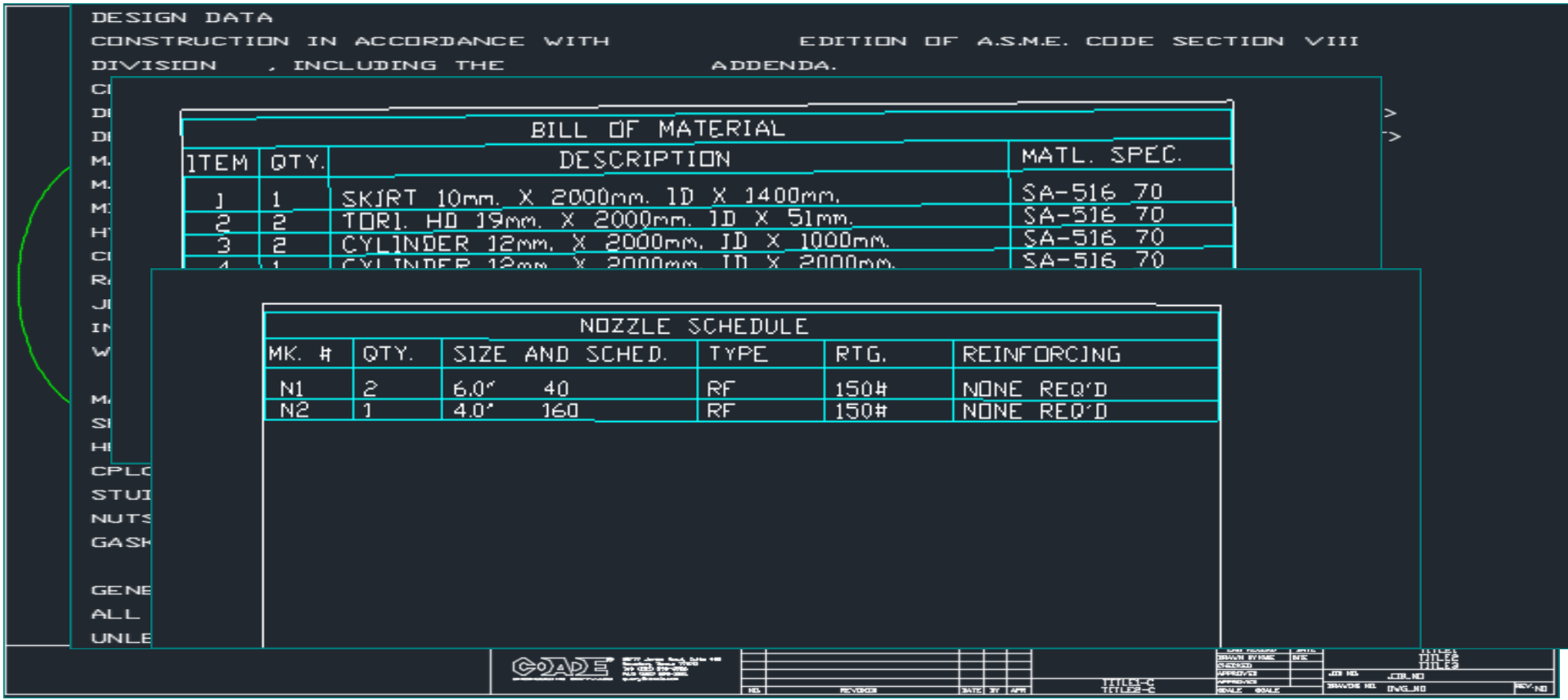
Course(s)			Material	Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B & C)			Heat Treatment	
No.	Diameter	Length	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
1	70.866 in.	16.142 ft.	SA-516 70	0.433 in.	0.039 in.	1		1.00			1.00		

ImageGrafix
Computer Solutions for Engineers

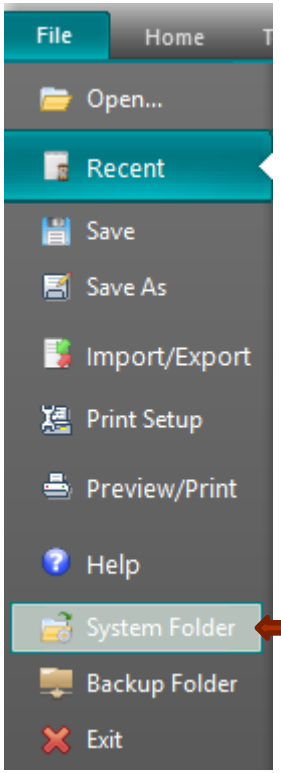
Exporting to ASME U forms



DXF File Generation



DXF File Generation

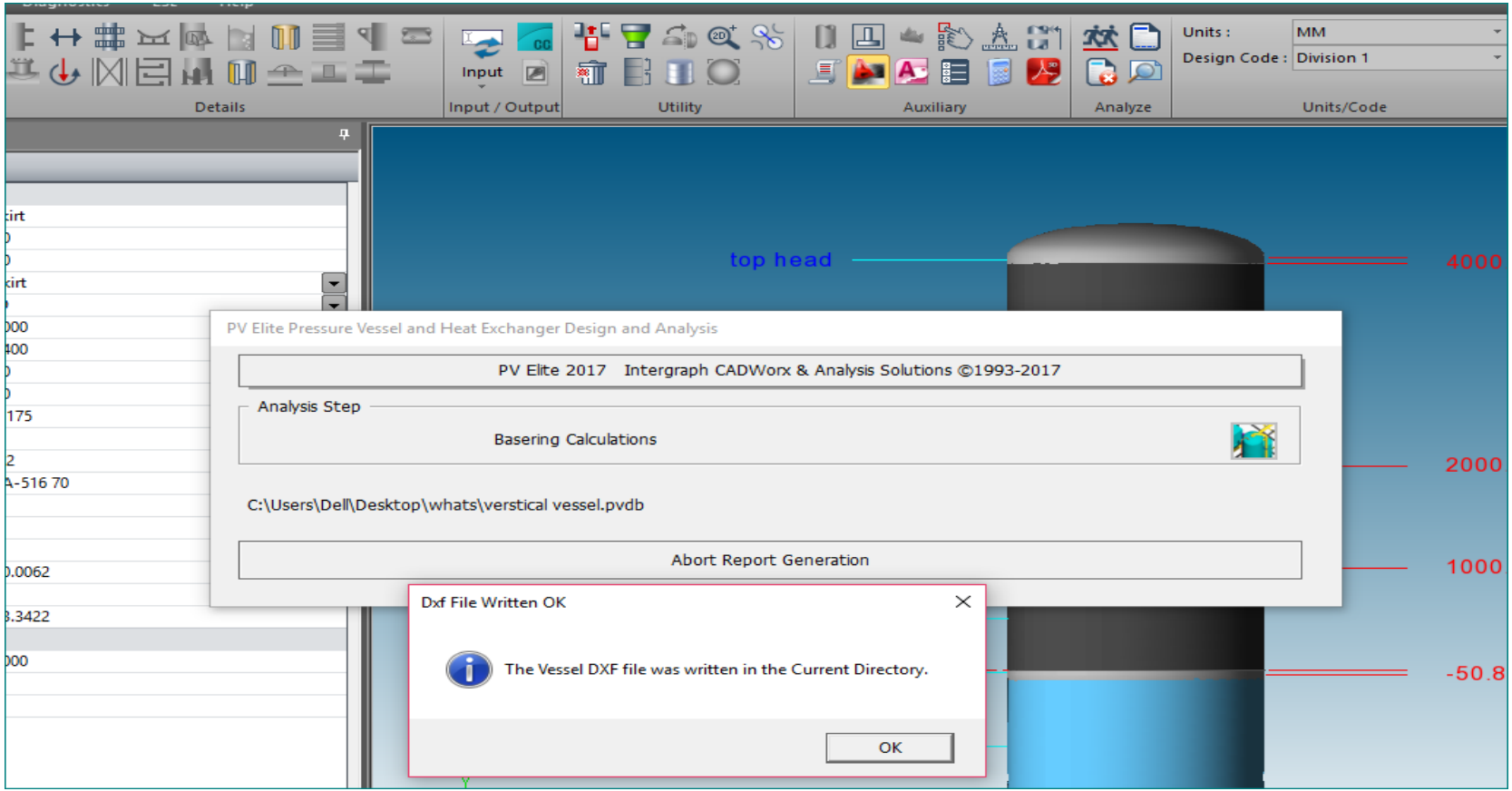


DataNote - Notepad

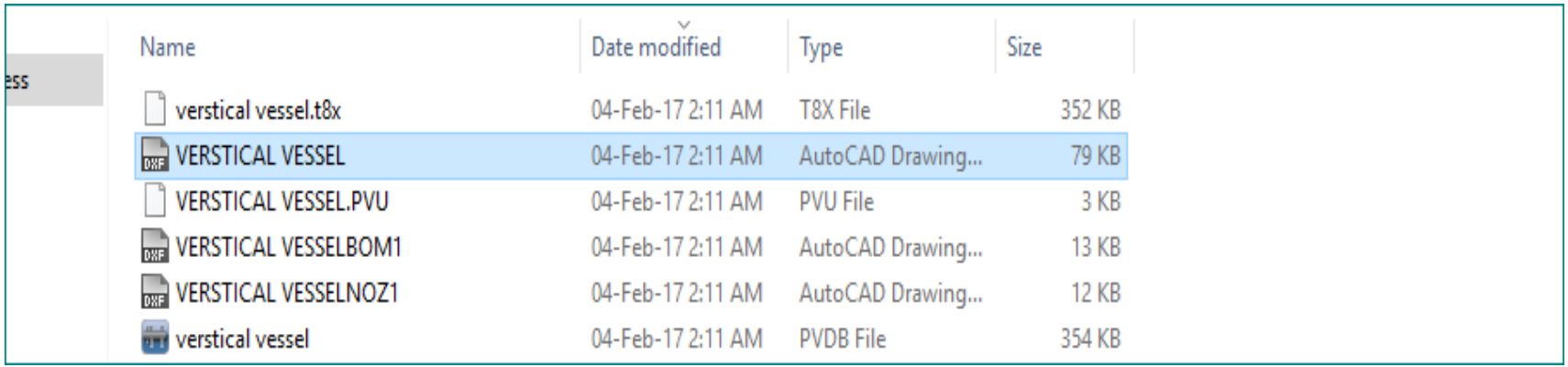
File Edit Format View Help

```
                                DESIGN DATA
CONSTRUCTION IN ACCORDANCE WITH          EDITION OF A.S.M.E. CODE SECTION VIII
DIVISION    , INCLUDING THE          ADDENDA.
CODE STAMP              REQ'D       NATIONAL BOARD
DESIGN PRESS (INT)   30              <UNIT>              TEMP                <UNIT>
DESIGN PRESS (EXT)    30             <UNIT>              TEMP                <UNIT>
M.A.W.P. (DESIGN)     30             <UNIT>              LIMITED BY
M.A.P.    (N.& C.)                  <UNIT>             LIMITED BY
MIN. DESIGN METAL TEMP.             <UNIT>             @                   <UNIT>
HYDROSTATIC TEST                    <UNIT> (1.3 * M.A.W.P.)
CORROSION ALLOW. SHELL               HEADS             NOZZLES
RADIOGRAPH                      P.W.H.T.               MFG. SER. #
JOINT EFF. HEADS                     SHELLS
INSPECTED BY IMAGEGRAFIX
WEIGHT EMPTY                <UNIT>      FULL OF WATER

                                MATERIAL
SHELL    SA 516 GR 70                              FLANGES    SA 516 GR 70
HEADS     SA 516 GR 70                               SUPPORTS    SA 516 GR 70
CPLGS.    SA 516 GR 70                               INTERNALS
STUDS                                  REINF. PADS
NUTS                                   NOZZLE NECKS
GASKETS

                               GENERAL NOTES
ALL BOLT HOLES TO STRADDLE THE NORMAL VESSEL CENTERLINES OR THEIR PARALLELS
UNLESS NOTED.

AFTER HYDROSTATIC TEST, THE VESSEL SHALL BE DRAINED AND THOROUGHLY CLEANED
TO REMOVE ALL GREASE, SCALE, AND OTHER FOREIGN DEBRIS.
```

DXF File Generation



DXF File Generation



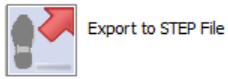
Name	Date modified	Type	Size
verstical vessel.t8x	04-Feb-17 2:11 AM	T8X File	352 KB
VERSTICAL VESSEL	04-Feb-17 2:11 AM	AutoCAD Drawing...	79 KB
VERSTICAL VESSEL.PVU	04-Feb-17 2:11 AM	PVU File	3 KB
VERSTICAL VESSELBOM1	04-Feb-17 2:11 AM	AutoCAD Drawing...	13 KB
VERSTICAL VESSELNOZ1	04-Feb-17 2:11 AM	AutoCAD Drawing...	12 KB
verstical vessel	04-Feb-17 2:11 AM	PVDB File	354 KB

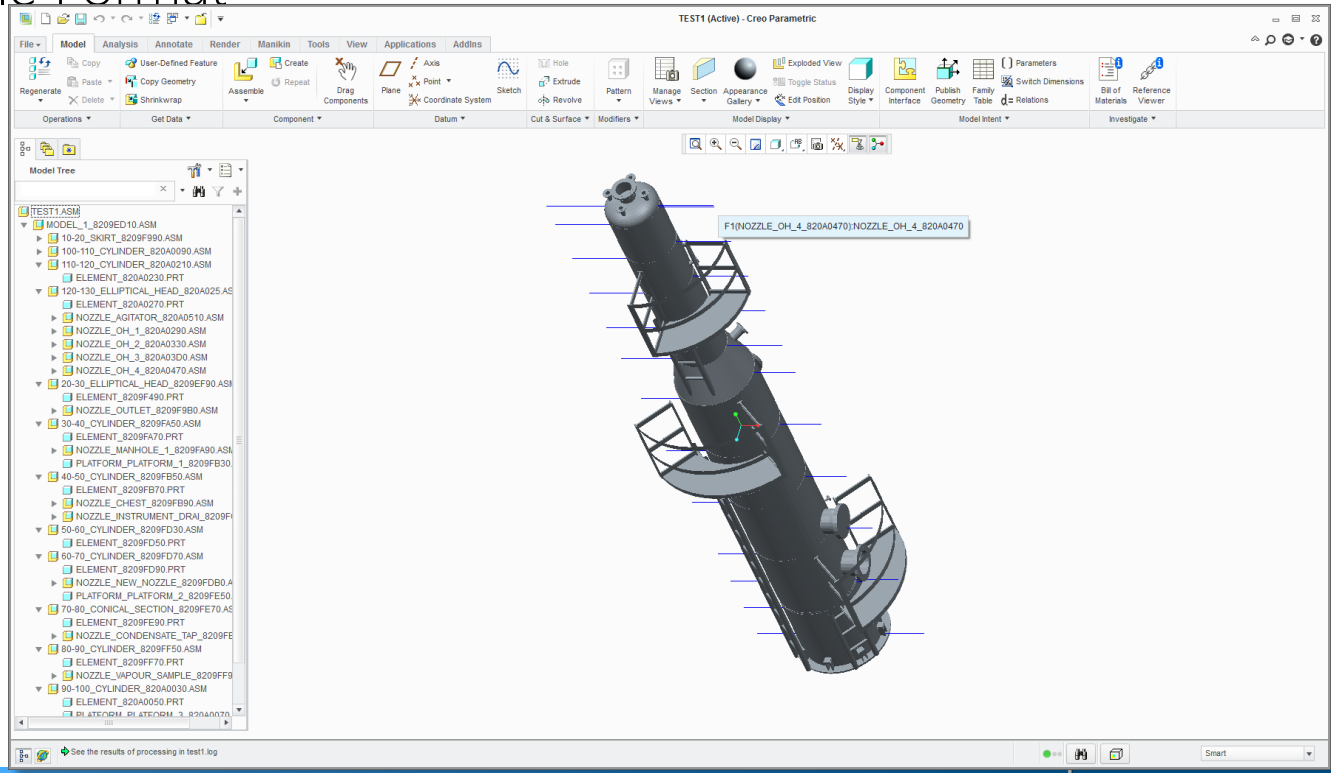
Productivity Enhancements

Getting the job done faster

Productivity Enhancements

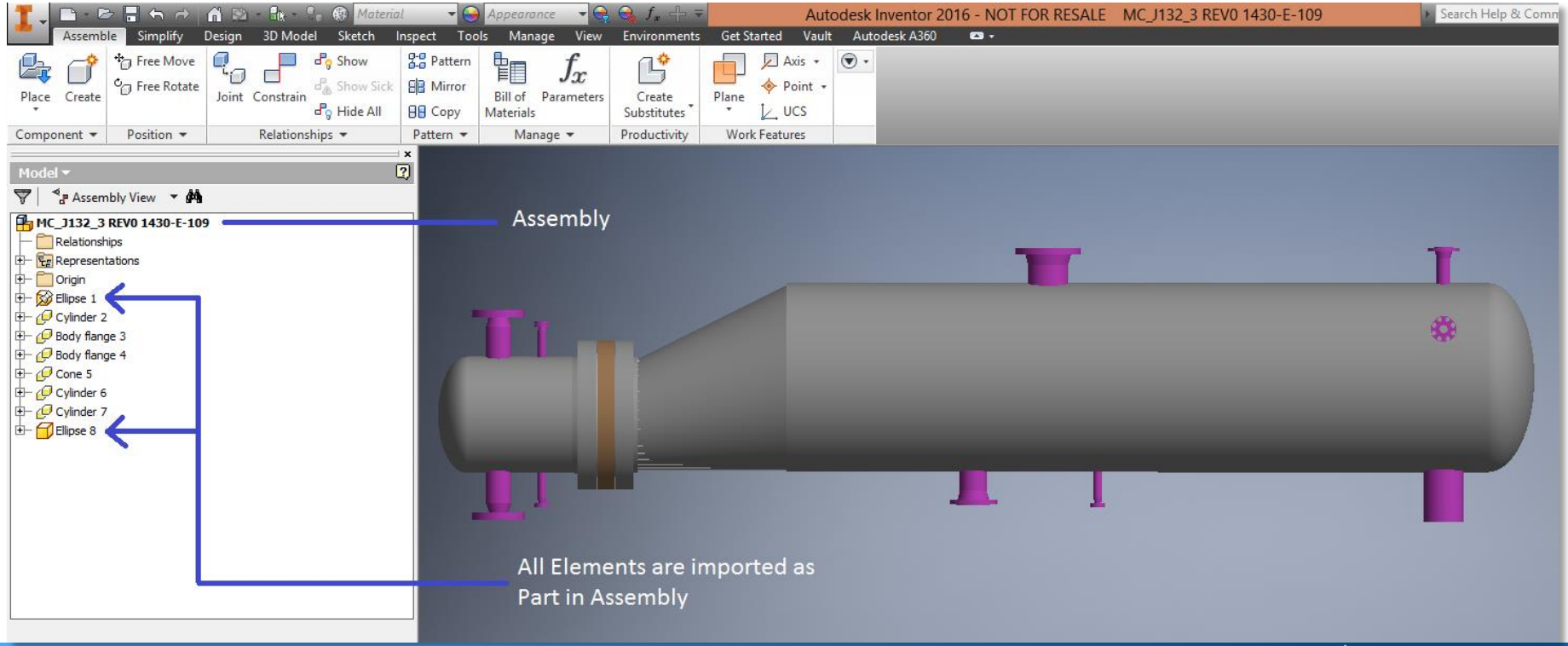
- Export to Step File Format





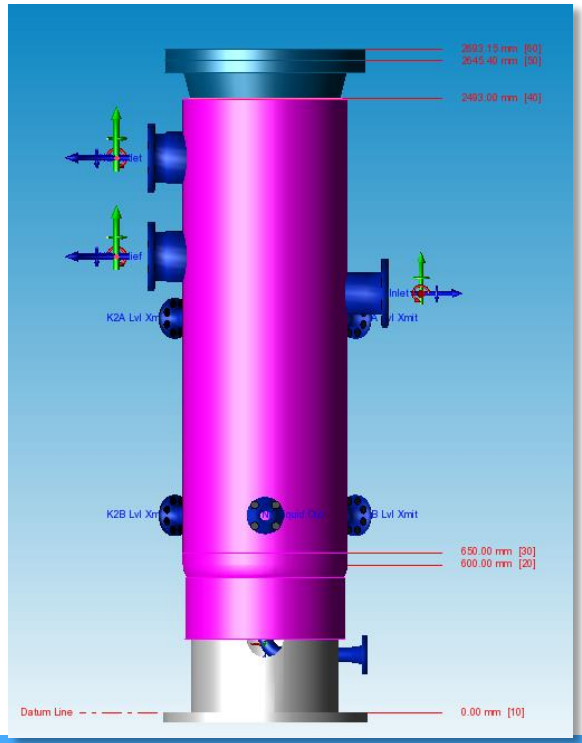
Productivity Enhancements

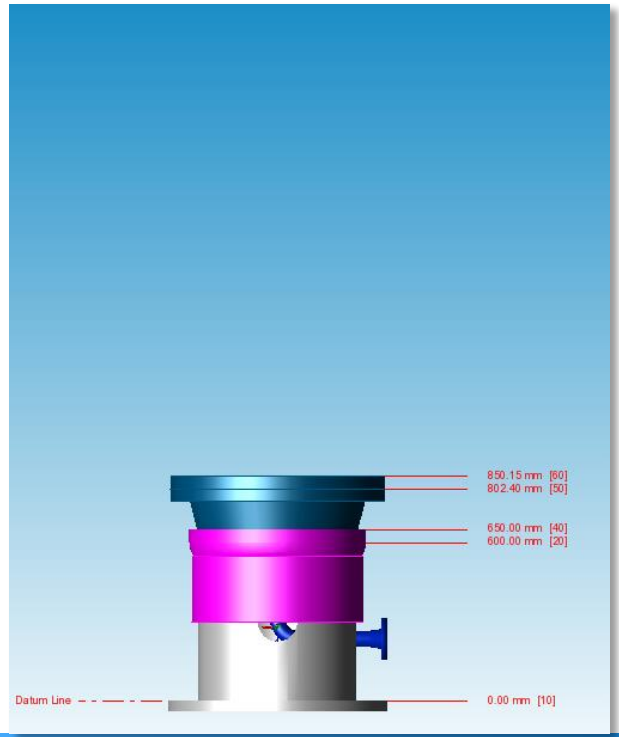
- Export to Autodesk Inventor (Spring 2017), SolidWorks to follow

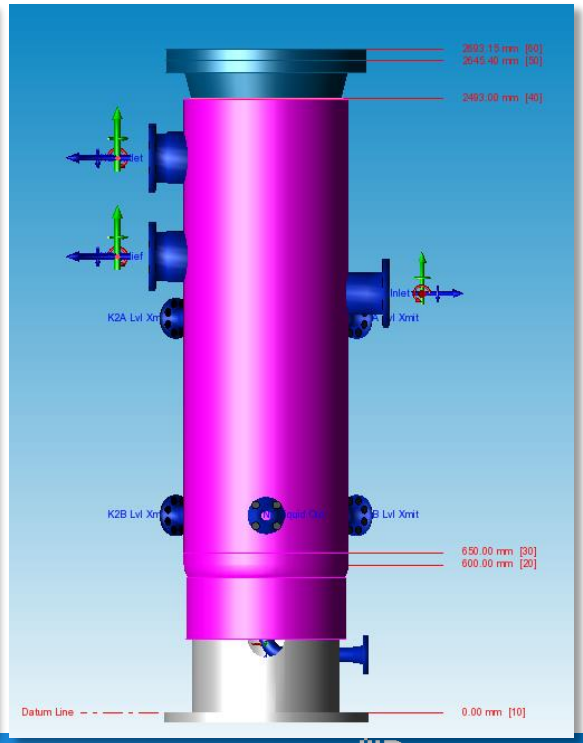


Productivity Enhancements

- Undo/Redo

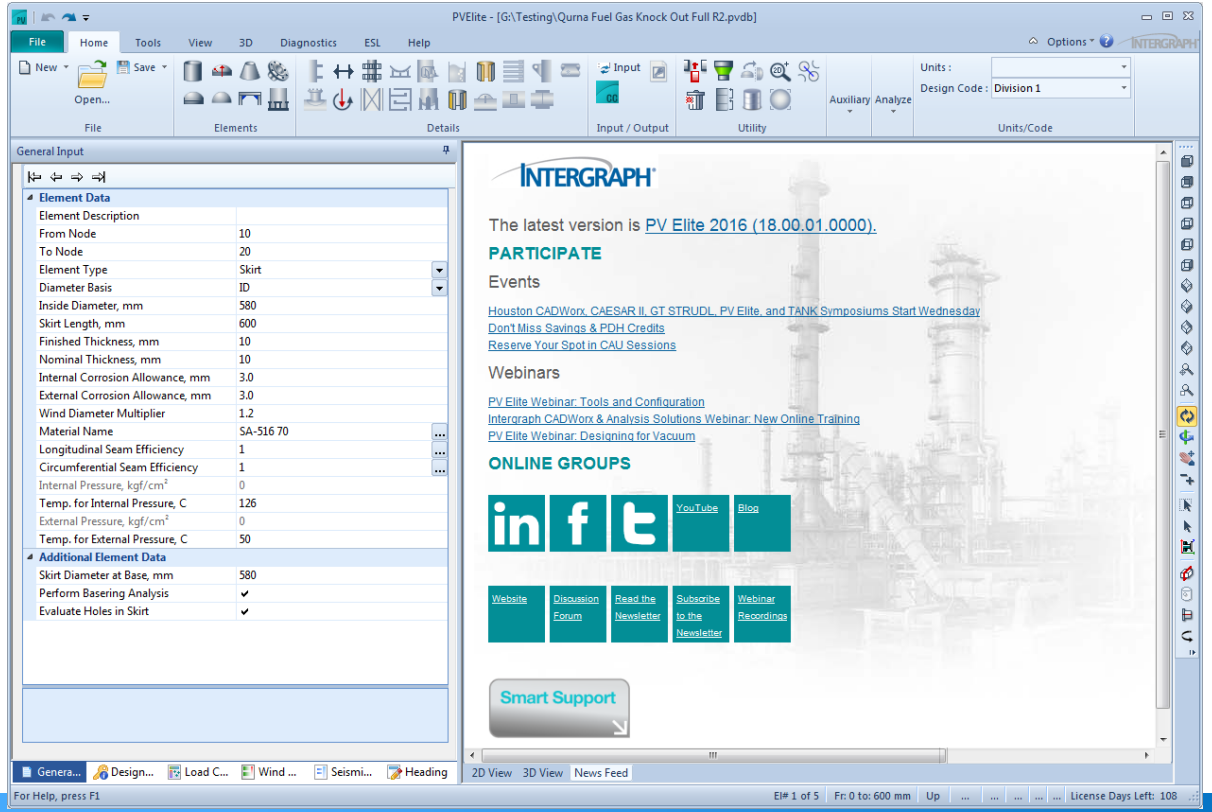






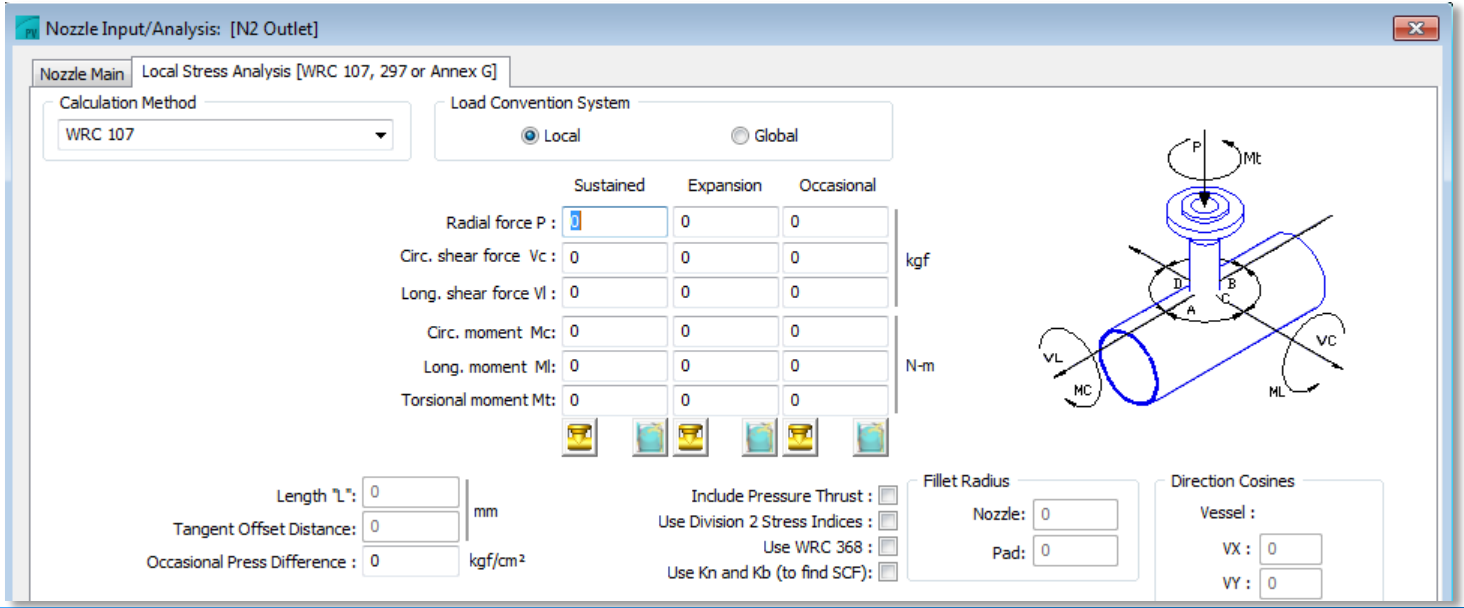
Productivity Enhancements

News Feed – Staying in Touch



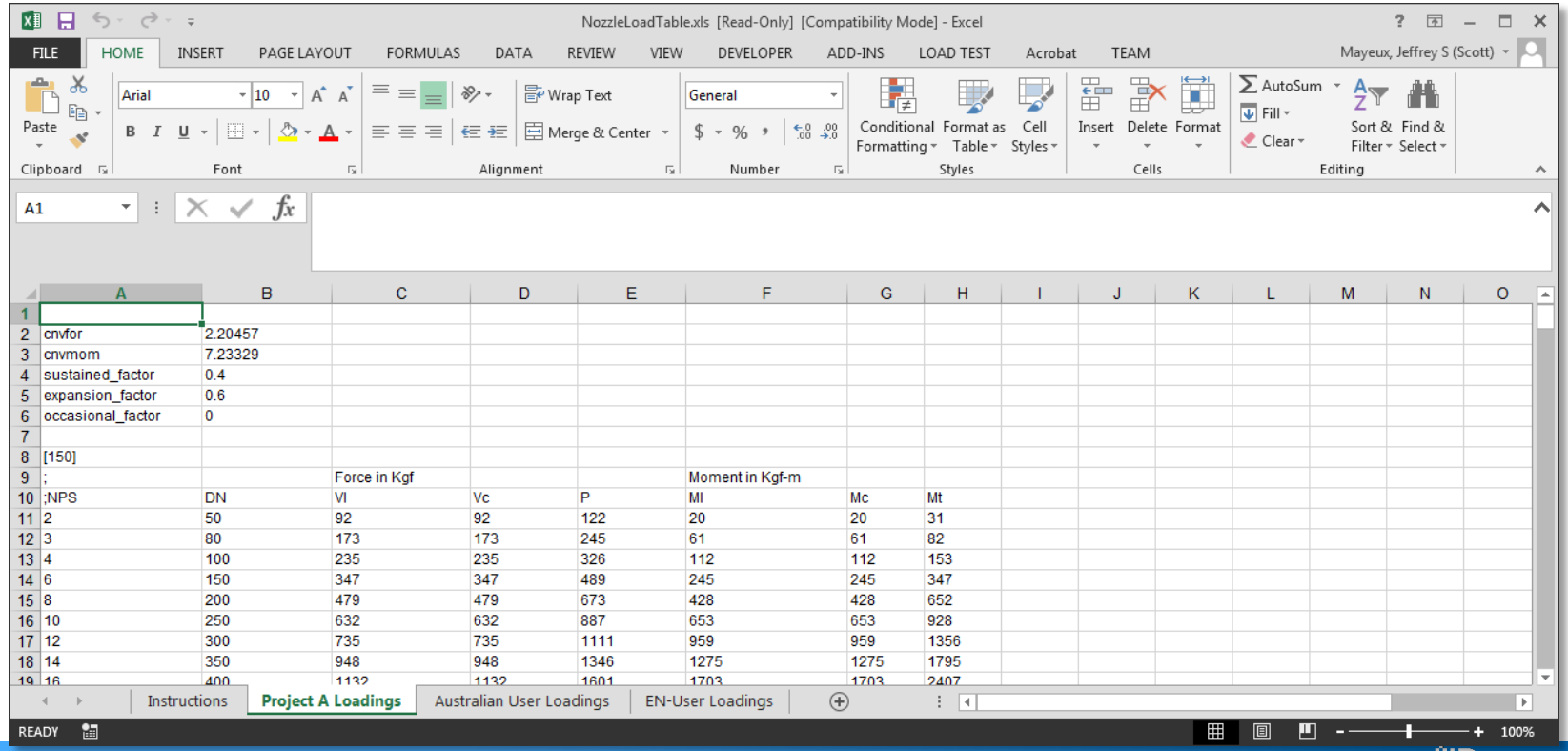
Productivity Enhancements

- Easily create and use custom data via MS Excel
- Share common data with other PV Elite users to increase productivity



Productivity Enhancements

Nozzle Loadings, Saddle dimensions etc. read directly from Excel

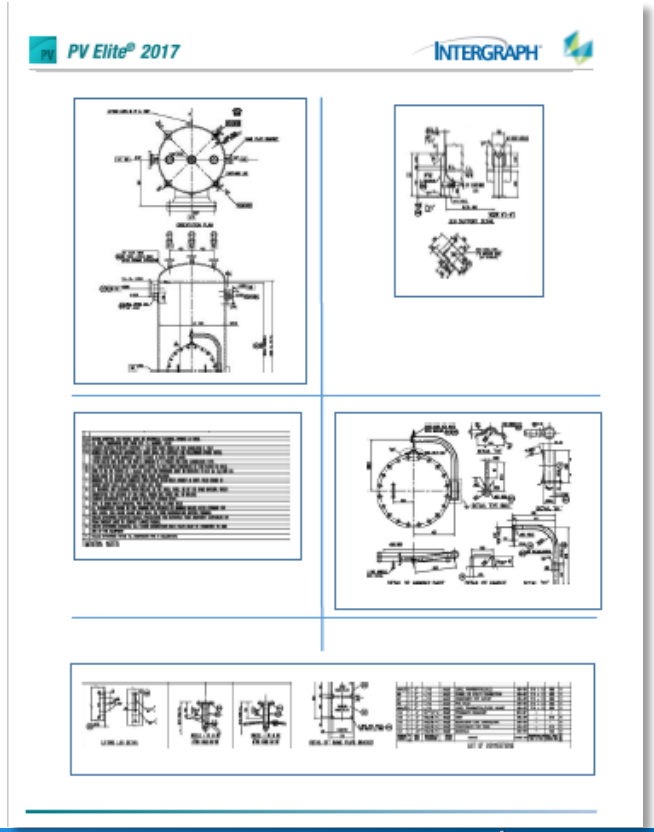


	A	B	C	D	E	F	G	H
1								
2	cnvfor	2.20457						
3	cnvmom	7.23329						
4	sustained_factor	0.4						
5	expansion_factor	0.6						
6	occasional_factor	0						
7								
8	[150]							
9	;		Force in Kgf			Moment in Kgf-m		
10	;NPS	DN	Vl	Vc	P	Ml	Mc	Mt
11	2	50	92	92	122	20	20	31
12	3	80	173	173	245	61	61	82
13	4	100	235	235	326	112	112	153
14	6	150	347	347	489	245	245	347
15	8	200	479	479	673	428	428	652
16	10	250	632	632	887	653	653	928
17	12	300	735	735	1111	959	959	1356
18	14	350	948	948	1346	1275	1275	1795
19	16	400	1132	1132	1601	1703	1703	2407

Productivity Enhancements

User definable 1st page.

- Global project page (system folder)
- Local project page for each project (local folder)

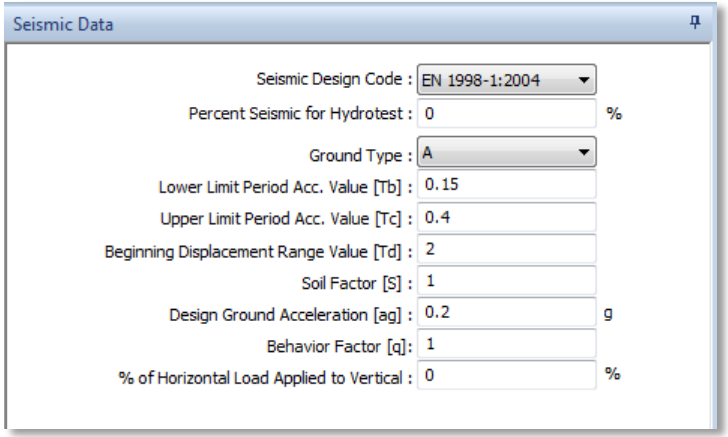


New Codes & Code Updates

European Seismic Code is new PV Elite 2017

New Codes and Code Updates

European Seismic Code Implemented: EN 1998-1:2004



Input Values:

Seismic Design Code		EN 1998-1:2004
Soil Type	A - Rock or Rock like strata	
Design Ground Acceleraton	[ag]	0.2000
Lower Limit Period Acc. Value	[TB]	0.1500
Upper Limit Period Acc. Value	[TC]	0.4000
Beginning Displacement Range Value	[TD]	2.0000
Soil Factor	[S]	1.0000
Behavior Factor	[q]	1.0000
% of Horizontal Load Applied to Vertical		0.0000 %

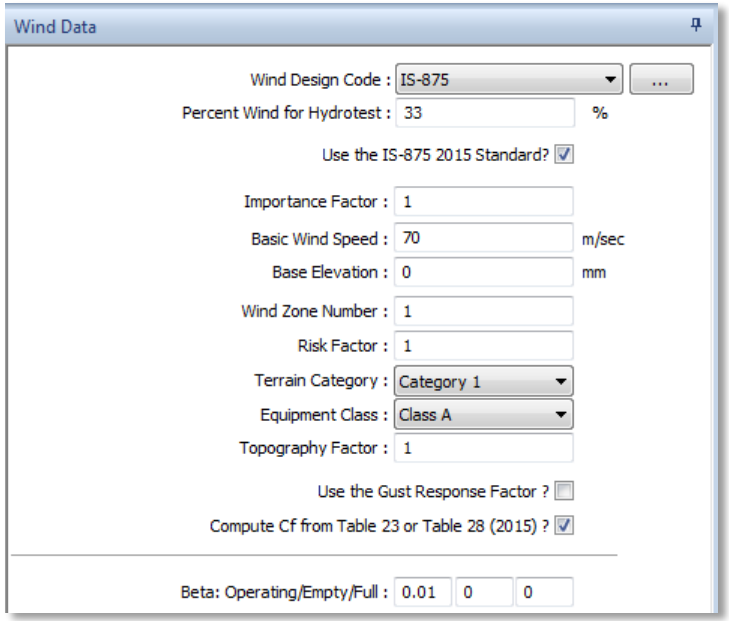
Calculated Values:

Fundamental period of vibration [T]:
= 1 / Natural Frequency
= 1/36.102
= 0.028 sec

Lateral Acceleration Value [Sd(T)]:
= ag * S(2/3 + T/TB(2.5/q - 2/3))
= 0.2 * 1.0 (2/3 + 0.028/0.15 (2.5/1.0 - 2/3))
= 0.201

New Codes and Code Updates

IS 875 2015 Wind Code



Wind Load Calculations per India Std. IS-875 (Section 4) - 2015

Input Values:

Wind Design Code		IS-875 2015	
Basic Wind Speed for IS-875		70.0	m/sec
Wind Zone Number		1	
Base Elevation		0.0	mm
Percent Wind for Hydrotest		33.0	
Risk Factor	[k1]	1.0	
Terrain Category		1	
Equipment Class		Class A	
Topography Factor	[k3]	1.0	
Importance Factor	[k4]	1.0	
Damping Factor (Beta) for Wind (Ope)		0.0100	
Damping Factor (Beta) for Wind (Empty)		0.0000	
Damping Factor (Beta) for Wind (Filled)		0.0000	
Use Gust Response Factor (Dynamic Analysis)		No	

Analysis Items

Enhanced analysis including more Division 2 calculations

Analysis Items

Division 2 Heat Exchanger Analysis/Terminology

Detailed Results for load Case D2 corr. (Psd,max + Ptd,min)

Intermediate Calculations For Gasketed Tubesheets:

ASME Code, Section VIII, Division 2, 2015

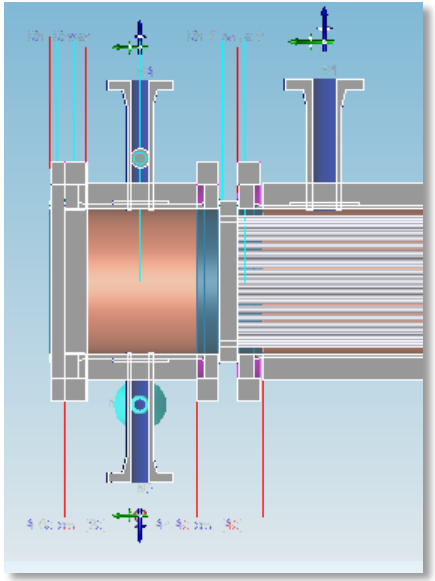
Gasket Contact Width,	N = (Goc-Gic) / 2	15.000	mm
Basic Gasket Width,	b0 = N / 2.0	7.500	mm
Effective Gasket Width,	b = SQRT(b0) * 2.5	6.899	mm
Gasket Reaction Diameter,	G = Go-2.0*b	498.203	mm

Flange Design Bolt Load, Seating Condition	W :	76300.92	kgf
Flange Design Bolt Load, Operating Condition	Wm1:	51399.05	kgf

Results for ASME Stationary Tubesheet Calculations for Configuration d,

Results for Tubesheet Calculations Original Thickness :

ASME Section VIII-2 Part 4.18.9.4 Step 1:



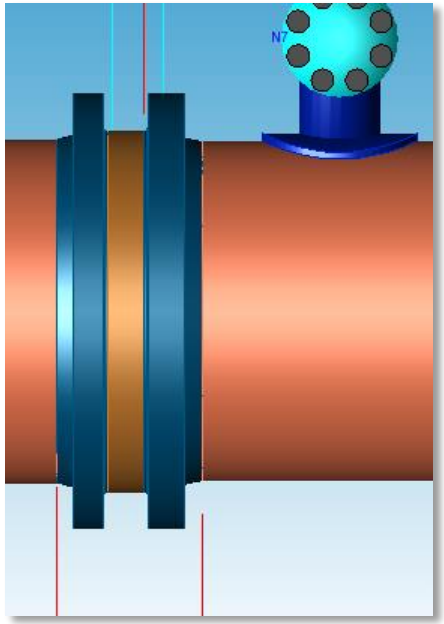
Analysis Items

MAWP Calculations for flanges that sandwich a tubesheet

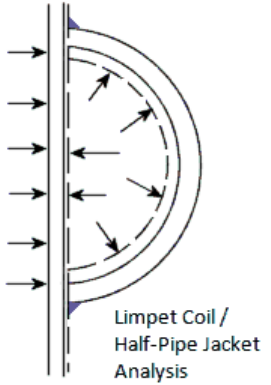
Element Required Thickness and MAWP :

From	To	Design Pressure bars	M.A.W.P. Corroded bars	M.A.P. New & Cold bars	Minimum Thickness mm.	Required Thickness mm.
Channel Shell		50.34	52.1323	74.7002	64	61.9085
Channel Shell		50.34	50.8218	72.7302	64	63.4086
Channel Flange a		50.34	50.8221	54.9762	286	282.397
Shell Flange atT		3.52	13.7335	51.4323	355	349.682
Shell 1		3.52	14.2528	18.6246	16	6.61185
Shell 2		3.52	27.824	32.3962	28	6.61185
Shell 3		3.52	14.2528	18.6246	16	6.61185
Shell Head		3.52	12.0316	16.4101	14	6.60692

Level of Precision (equations and substitutions) : 2



Half Pipe Jackets per Division 2



Half-Pipe Jacket Analysis per ASME VIII-2, 4.11.6

Shell Thickness Calculations:

Cylindrical Shell Calculation - Section 4.3.3.1

Computed Minimum Required Thickness [t]:

```
= 0.5 * D( exp( P/(S*E) )-1) + ca + co
= 0.5 * 96.0 (exp( 100.073/(23200.0 *1.0 ))-1) + 0.0 + 0.0
= .207 in.
```

Req. Thk. of Shell to Withstand Jacket Pressure (Includes CA) [Trj]:

```
= .191 in.
```

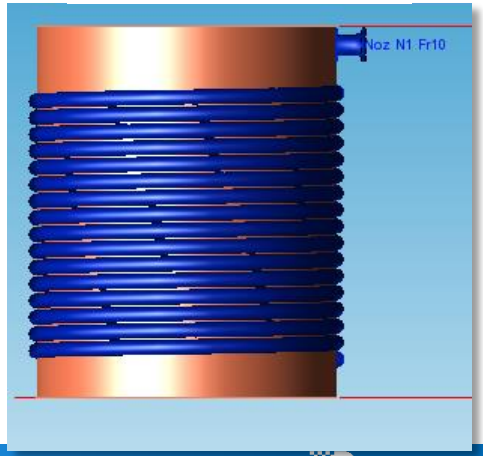
Pressure Calculations for Input Shell Thickness:

Input Value of Shell Thickness [ts]:

```
= 0.5000 in.
```

Half-Pipe Jacket Rating Factor [Kp]:

```
= 37.181
```



Large Central Opening Analysis per Division 2

Stress Results for the Opening Head Juncture :

Longitudinal Hub Stress in Central Opening [SHO]:
 = X1 * SH = (0.17 * 33264.047) = 5666.807 psi

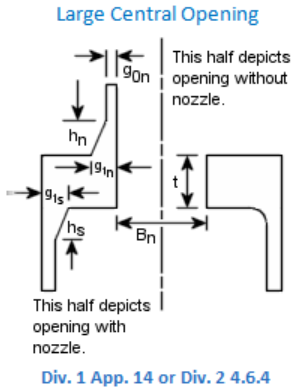
Radial Stress at Central Opening [SRO]:
 = X1 * SR = (0.17 * 23598.725) = 4020.239 psi

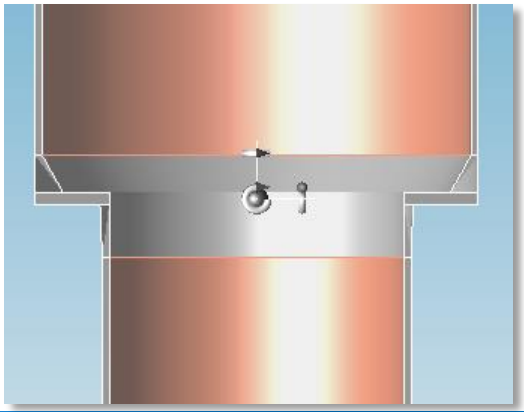
Tangential Stress at Diameter of Central Opening [Sto]:
 = X1*ST + 0.64*F*Z1*MH/(Bs*ho*t)
 = 0.17 * 7605.652 +
   0.64 * 0.6968 * 3.693 * 40742/(23.5 * 2.437 * 0.5)
 = 3639.145 psi

where Z1 = 2*K²/(K²-1) = (2*2.181 + 1)/(2.181 - 1) = 3.693

Flange Stress Results per 4.6.4 (psi)

	Head/Shell	Allowed	Opening	Allowed
Long. Hub SH	9165	34800	5667	34800
Radial SR	15774	23200	4020	23200
Tangential ST	-2309	23200	3639	23200
Average (SH+SR)/2	12470	23200	4844	23200
Average (SH+ST)/2	3428	23200	4653	23200

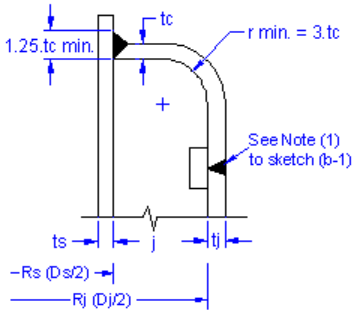




Jacketed Vessel Analysis per Division 2

Jacket Design per ASME VIII, Division 2, 4.11.7: Jacket

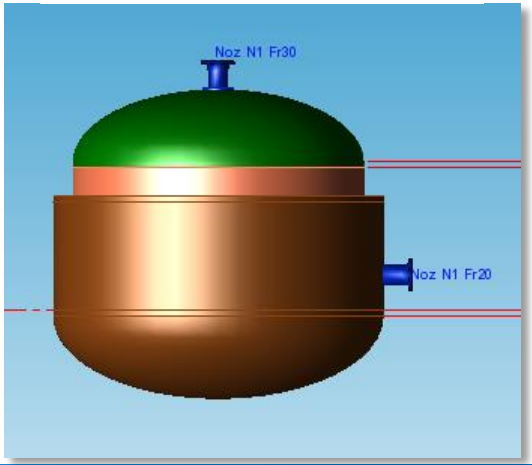
Design per: Figure 4.11.1 Type 2
Attachment per: Table 4.11.1, Detail 2, Figure: (c)



Div. 1 (b-3) or Div. 2 Detail 2 Figure (c)

Input Values:

Jacket Design Internal Pressure	Pj	50.00	psig
Jacket Design Temperature (Internal)		200	°F
Jacket Design External Pressure	Pje	15.00	psig
Jacket Design Temperature (External)		200	°F
Static fluid Pressure in this Jacket	pStatic	0.00	psig
Closure Bar Material		SA-516 70	
Closure Bar Design Stress	[S or f]	23200.00	psi
Closure Bar Thickness New	tc	2.0000	in.
Closure Bar Corrosion Allowance	cc	0.1250	in.
Inner Shell Outside Diameter	Dso	98.000	in.
Inner Shell Thickness New	ts	1.0000	in.
Inner Shell Corrosion Allow. Inside	csi	0.1250	in.
Inner Shell Corrosion Allow. Outside	cso	0.0000	in.
Inner Shell Vacuum Pressure		15.0000	psig

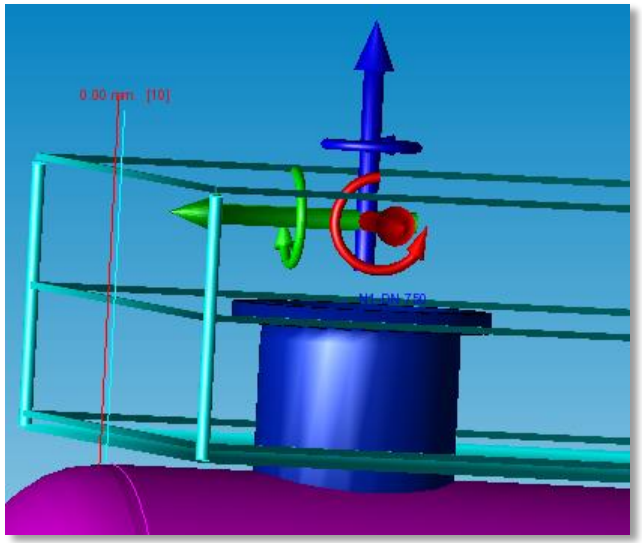


Analysis Items

Option for No B31.3 Piping Load Checks on Nozzles

Nozzle Analysis Directives

- [ ] No Corrosion on Inside Welds
- [ ] Use AD-540.2 Sketch b and Not Sketch d for Normal Limit (Pre 2007)
- [ ] Compute Increased Nozzle Thickness
- [ ] Compute and Print Areas for Small Nozzles
- [ ] Compute Chord Length in Hillside Direction
- [ ] Compute Areas per PD:5500 3.5.4.9
- [ ] Nozzle Opening MAWP Is Not Restricted by the Shell (ASME)
- [x] No B31.3 Stress Checks on Nozzles (ASME)



Minimum Wall Thickness of Nozzle Necks [tUG-45]:

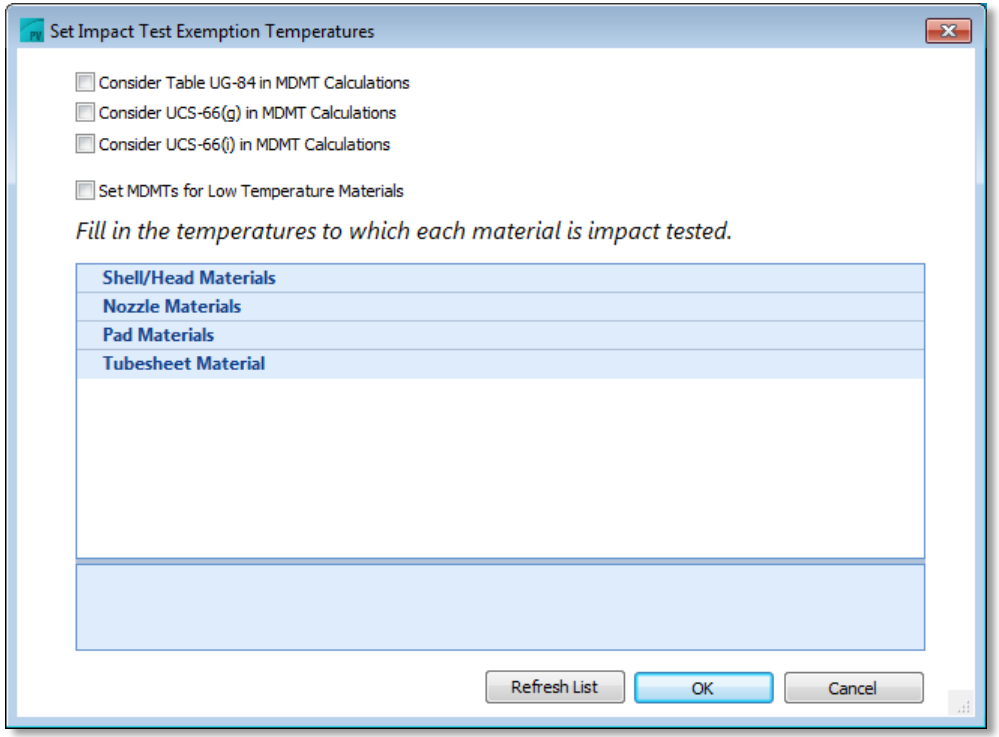
```
 = max( ta, tb )
 = max( 5.43, 11.1 )
 = 11.0513 mm.
```

Available Nozzle Neck Thickness = 28.0000 mm. --> OK

Nozzle stresses due to External and Pressure Loads have not been computed due to user request.

Analysis Items

Specification of Impact Test Temperature of Tubesheet Material



API 579 - 2016

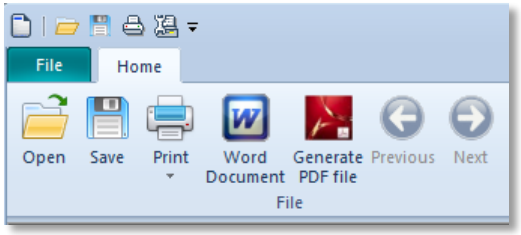
- Released August 8, 2016
- Changes to be incorporated in PV Elite for:
  - General Corrosion (Part 4)
  - Localized Corrosion (Part 5)
    - Local Thinning Area
    - Groove
  - Pitting
  - Levels 1 and 2 for all three Parts

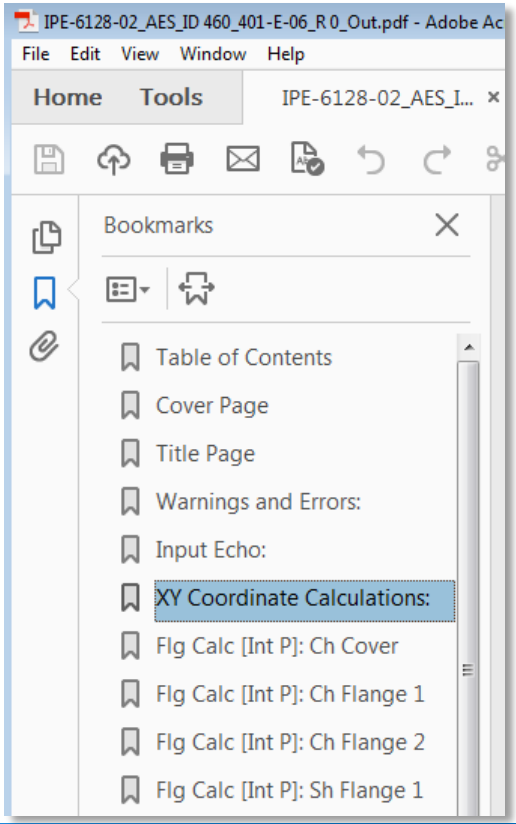
Output Generation & Reports

Streamlining the report creation process

Output Generation & Reports

One click PDF creation





Output Generation & Reports

Wider, easier to read, more spacious reports

Stresses in the Vessel at the Attachment Junction (kgf/cm²)

Type of Stress Load	Stress Intensity Values at Au	Al	Bu	Bl	Cu	Cl	Du	Dl
Circ. Memb. P	-20.4	-20.4	-20.4	-20.4	-18.5	-18.5	-18.5	-18.5
Circ. Bend. P	-65.5	65.5	-65.5	65.5	-86.0	86.0	-86.0	86.0
Circ. Memb. MC	0.0	0.0	0.0	0.0	-12.2	-12.2	12.2	12.2
Circ. Memb. MC	0.0	0.0	0.0	0.0	-261.9	261.9	261.9	-261.9
Circ. Memb. ML	-56.7	-56.7	56.7	56.7	0.0	0.0	0.0	0.0
Circ. Bend. ML	-171.8	171.8	171.8	-171.8	0.0	0.0	0.0	0.0
Tot. Circ. Str.	-314.4	160.1	142.6	-69.9	-378.6	317.2	169.6	-182.0
Long. Memb. P	-18.5	-18.5	-18.5	-18.5	-20.4	-20.4	-20.4	-20.4
Long. Bend. P	-88.7	88.7	-88.7	88.7	-64.9	64.9	-64.9	64.9
Long. Memb. MC	0.0	0.0	0.0	0.0	-18.0	-18.0	18.0	18.0
Long. Bend. MC	0.0	0.0	0.0	0.0	-149.8	149.8	149.8	-149.8
Long. Memb. ML	-15.7	-15.7	15.7	15.7	0.0	0.0	0.0	0.0
Long. Bend. ML	-274.1	274.1	274.1	-274.1	0.0	0.0	0.0	0.0
Tot. Long. Str.	-397.0	328.7	182.6	-188.2	-253.1	176.4	82.4	-87.3
Shear VC	12.4	12.4	-12.4	-12.4	0.0	0.0	0.0	0.0
Shear VL	0.0	0.0	0.0	0.0	-16.4	-16.4	16.4	16.4
Shear MT	41.9	41.9	41.9	41.9	41.9	41.9	41.9	41.9
Tot. Shear	54.2	54.2	29.5	29.5	25.5	25.5	58.3	58.3
Str. Int.	423.9	344.6	198.3	195.2	383.6	321.7	198.8	209.8

Output Generation & Reports

External Pressure Summary moved to the top of the report

PV Elite® 2017

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FileName : IPE-6128-02 AES ID 460 401-E-06 R 0 Page 1 of 4
External Pressure Calculations: Step: 10 2:01pm Sep 14,2016

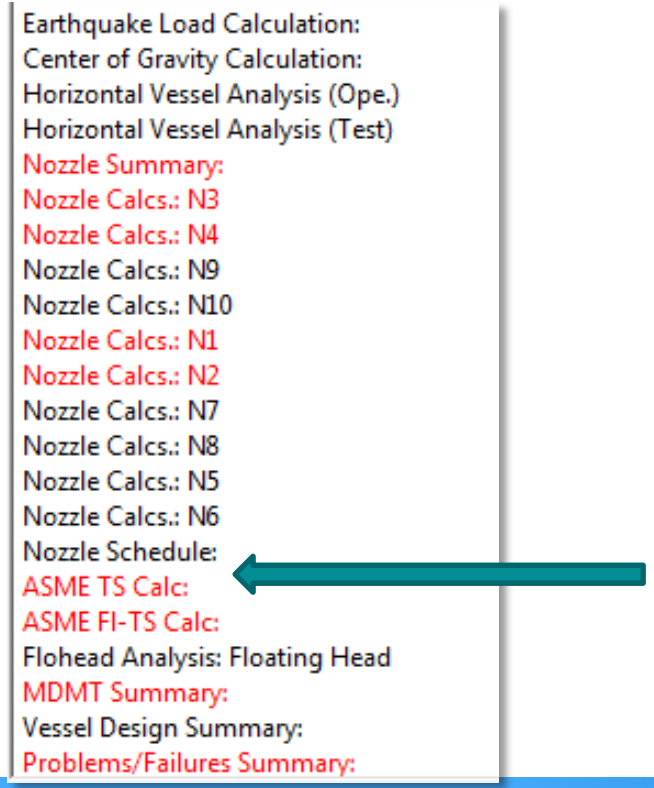
External Pressure Calculation Results :

External Pressure Calculations:

From	To	Section Length cm	Outside Diameter mm	Corroded Thickness mm	Factor A	Factor B kgf/cm²
10	20	No Calc	...	42.0	No Calc	No Calc
20	30	No Calc	...	38.0	No Calc	No Calc
30	40	35.0	486.0	10.0	No Calc	No Calc
40	50	No Calc	...	38.0	No Calc	No Calc
50	60	No Calc	...	47.0	No Calc	No Calc
60	90	564.60	480.0	7.0	No Calc	No Calc
90	100	No Calc	...	57.0	No Calc	No Calc
100	110	No Calc	...	52.0	No Calc	No Calc
110	120	37.750	590.0	7.0	No Calc	No Calc
120	130	No Calc	590.0	7.0	No Calc	No Calc

Output Generation & Reports

Nozzle Summary moved to proceed the nozzle analysis reports



Fixes in the Newer Version

Errors & Bugs resolved in PV Elite 2017 & SP1

Errors & Bugs resolved in Latest Version

Case 1 :-

- Shell design pressure: 386 PSI
- Shell MAWP: 462.8 PSI (Component MAWP)
- Shell side MAWP: 323.3 PSI

Output of PV Elite

Element Thickness, Pressure, Diameter and Allowable Stress :

From	To	Int. Press + Liq. Hd psig	Nominal Thickness in.	Total Corr Allowance in.	Element Diameter in.	Allowable Stress(SE) psi
BottomDish		314.206	1.62500	0.12500	157.008	19699.9
Channel Bt		312.917	1.62500	0.12500	156.772	17050.0
Main Shell		389.286	2.00000	0.12500	156.000	19699.9
Top Channe		305.189	1.62500	0.12500	156.772	17050.0
TopChannel		304.435	1.75000	0.12500	157.008	19699.9

Element Required Thickness and MAWP :

From	To	Design Pressure psig	M.A.W.P. Corroded psig	M.A.P. New & Cold psig	Minimum Thickness in.	Required Thickness in.
BottomDish		300.000	322.598	373.486	1.46875	1.37845
Channel Bt		300.000	309.143	409.522	1.62500	1.58194
Main Shell		386.000	462.801	505.050	2.00000	1.68733
Top Channe		300.000	316.871	409.522	1.62500	1.54557
TopChannel		300.000	331.044	368.204	1.68750	1.54156

Summary of Heat Exchanger Maximum Allowable Working Pressures :

Note:
For ASME Exchanger designs, the following values include MAWPs that consider the tubesheet, tubes, tube/tubesheet joint etc. These values were determined by iteration. Review the tubesheet analysis report for more information.

Shell Side MAWP	=	323.026 psig
Shell Side MAPnc	=	475.247 psig
Channel Side MAWP	=	309.143 psig
Channel Side MAPnc	=	368.204 psig

Errors & Bugs Resolved in latest Version

- We know that MAWP is limited by tube & shell stresses

- Although calculated shell side MAWP is less than shell side design pressure, there is no warning or error or any mention of it in failure summary.

Tubesheet MAWP used to Compute Hydrotest Pressure:

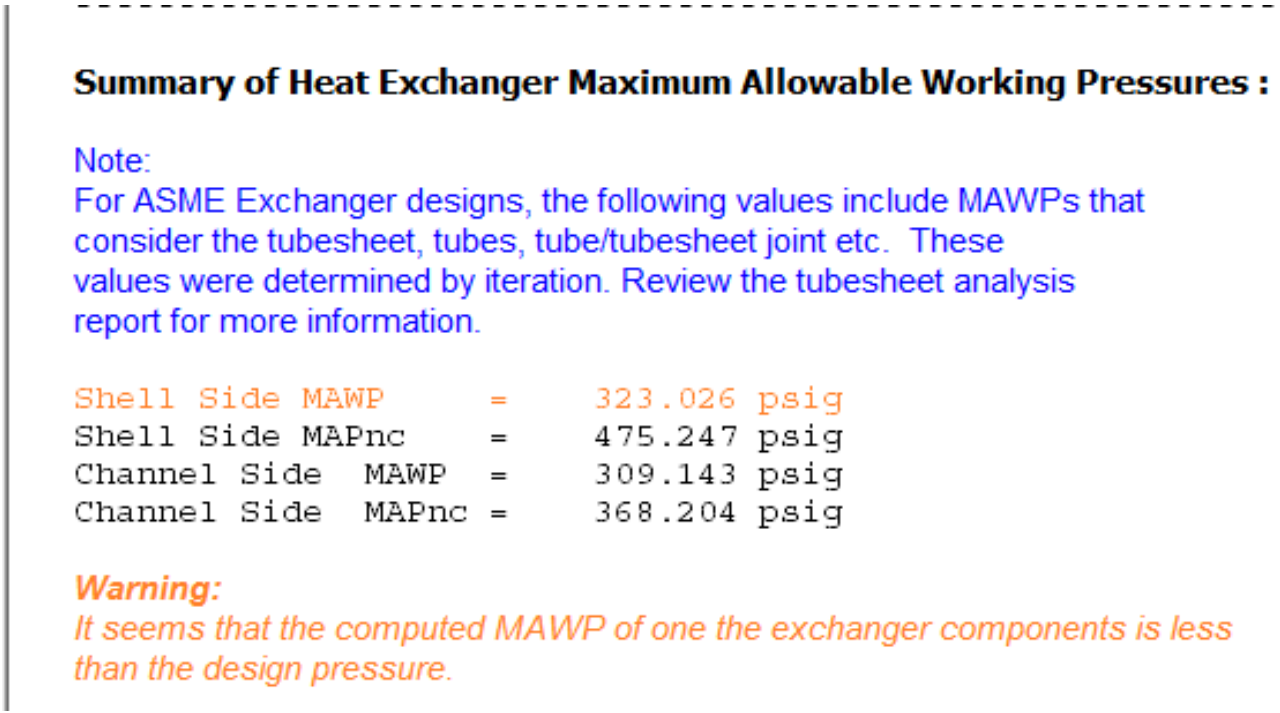
Stress / Force Condition	Tubeside MAWP	0 shellside Stress Rat.	Shellside MAWP	0 tubeside Stress Rat.
Tubesheet Bending Stress	429.73	1.000	331.96	1.000
Tubesheet Shear Stress	1069.46	1.000	668.40	0.995
Tube Tensile Stress	591.40	1.000	895.66	1.000
Tube Compressive Stress	764.50	0.625	323.03	1.000
Tube-Tubesheet Joint load	413.97	1.000	626.96	1.000
Shell Stress (Axial, Junc)	1124.97	1.000	323.03	0.511
Tubesheet-Channel Junction	430.60	1.000	323.03	0.105
Tube Pressure Stress	842.55	1.000	397.07	1.000
Minimum MAWP	**413.97**		**323.03**	

Tubesheet MAPnc used to Compute Hydrotest Pressure:

Stress / Force Condition	Tubeside MAPnc	0 shellside Stress Rat.	Shellside MAPnc	0 tubeside Stress Rat.
Tubesheet Bending Stress	500.60	1.000	921.98	1.000
Tubesheet Shear Stress	1852.12	1.000	2024.68	1.000
Tube Tensile Stress	866.08	1.000	1304.78	1.000
Tube Compressive Stress	1324.55	1.000	1119.68	1.000
Tube-Tubesheet Joint load	606.25	1.000	913.34	1.000
Shell Stress (Axial, Junc)	1234.34	1.000	1333.84	1.000
Tubesheet-Channel Junction	555.02	1.000	7160.13	1.000
Tube Pressure Stress	1203.65	1.000	475.25	1.000
Minimum MAPnc	**500.60**		**475.25**	

Errors & Bugs resolved in Latest Version

This issue has been resolved in 2017 version. Now it will give you a warning.



Summary of Heat Exchanger Maximum Allowable Working Pressures :

Note:
For ASME Exchanger designs, the following values include MAWPs that consider the tubesheet, tubes, tube/tubesheet joint etc. These values were determined by iteration. Review the tubesheet analysis report for more information.

```
Shell Side MAWP      =    323.026 psig
Shell Side MAPnc     =    475.247 psig
Channel Side  MAWP   =    309.143 psig
Channel Side  MAPnc  =    368.204 psig
```

Warning:
It seems that the computed MAWP of one the exchanger components is less than the design pressure.

Case 2 :- While doing Nozzle Analysis in a spherical vessel, PV Elite gives some warning

Nozzle Calculations per Section 4.5: Internal Pressure Case:

Nozzle Material Factor [frn]:
= min[Sn/S, 1]
= min[1626.4/2053.0, 1]
= 0.792

Thickness of Nozzle at Shell [tn]:
= hub thickness - corrosion allowance
= 145.0 - 1.5
= 143.500 mm

Thickness of Nozzle at Top [tn2]:
= thickness - corrosion allowance
= 16.0 - 1.5
= 14.500 mm

Shell Diameter to Thickness ratio [D/t]:
= Di/t
= 18003.0/35.0
= 514.371 must be less than 400; Calculation not possible.

Case 3 :- Material Updates

- It is observed that for SB-466 H55 material, PV Elite selects external pressure chart as NPC-3.
- As per ASME Section II-D, applicable pressure chart is NFC-3. There is no chart with title NPC-3.
- Please clarify the origin of NPC-3 & associated external pressure chart values.

Errors & Bugs resolved in Latest Version

- For the material SB-466- H55 listed in UNF23.2, temperature limit is 150°F. However, it is observed that no warning/ error message is generated even at design temperature of 550°F.

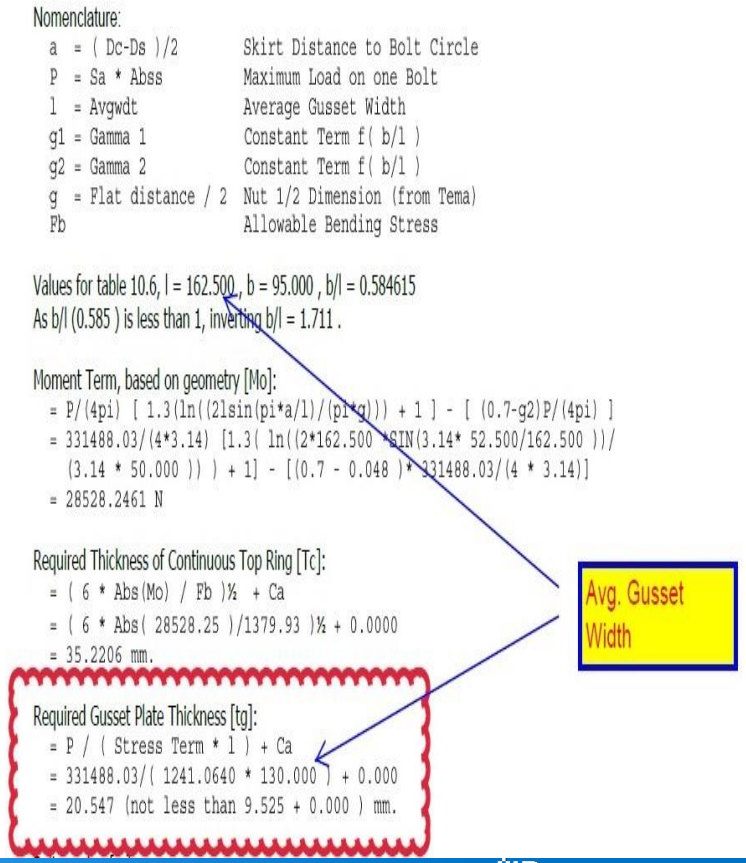
Solution :-

First of all NPC-3 is not a valid external chart, so we have updated PV Elite to correctly reference External Pressure Chart NFC-3 for material SB-466 H55. With the correct chart, you will then get a warning/error message regarding the temp. This issues has been resolved in PV Elite 2017 SP1

Errors & Bugs resolved in Latest Version

Case 4 :- Brownell & Young Method fo

- In Conical/Flare skirt, PV Elite is not taking correct value of avg. Gusset width in Gusset Calculation while using Brownell & Young's Method.
- In Gusset Calculation, PV Elite consider min. Gusset width (At bottom portion) instead of Avg. gusset width.



Errors & Bugs resolved in Latest Version

- However value of avg. gusset width (L) is shown correct in all the above calculations in PV Elite, but in gusset calculation it is taking the wrong value.

- Due to this issue, we need to provide heavy thickness of gusset which is not correct.

Summary of Basering Thickness Calculations

Required Basering Thickness (tension)	23.5060	mm.
Actual Basering Thickness as entered by user	55.0000	mm.
Required Thickness of Chair Cap	35.2206	mm.
Actual Top Ring Thickness as entered by user	50.0000	mm.
Required Gusset thickness, + CA	20.5473	mm.
Actual Gusset Thickness as entered by user	20.0000	mm.

*** Warning: Gusset Plate Thickness is less than required ! ***

Required Thickness of Skirt for Local Stress	16.0499	mm.
Given Thickness of Skirt	38.0000	mm.
Required Gusset Height to meet local stress	64.6486	mm.

Case 5 :- Input Processor

- Fixed an issue in PV Elite in which the software did not correctly import certain saddle data from a customized SaddleData.xls file. The issue has been resolved, and the software now uses the correct conversion factor for customized saddle data.

- Fixed an issue in CodeCalc in which the software displayed an incorrect label for operating loads when performing an FEA analysis for WRC 107/537 & WRC 297 nozzles. Previously when you selected **FEA** in the **Analysis Type** field for WRC modules, the software did not update the **Loads** tab to indicate where to enter operating loads. The issue has been resolved, and the software now renames the **Expansion** section to **Operating** when you perform an FEA analysis.

Case 6 :- Analysis And Calculations

- Fixed an issue in PV Elite in which the software did not calculate the hydrostatic head pressure for the last element of a model with a skirt that was completely filled with liquid. The issue has been resolved and the software now calculates the hydrostatic head pressure for all elements in the model.

- Updated PV Elite to no longer use the **Radial Top Plate Width** value when calculating the required thickness of the gusset plate. The software has been updated to use the **Average Gusset Plate Width** value in the **Required Gusset Plate Thickness** calculations on the **Basering Calculations** report.

Autodesk™ Inventor Plug-in

Autodesk Inventor Plugin

INTERGRAPH

Agenda

- PV Elite Requirements
- Plug-in UI
- Features

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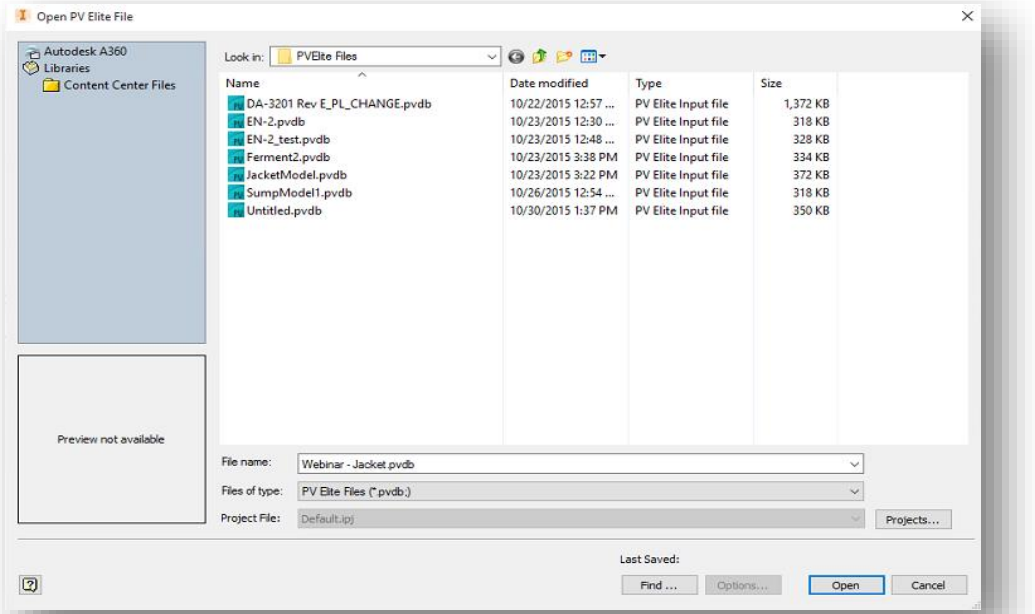
PV Elite Requirements

Autodesk Inventor Plug-in will load **only** *.pvdb files

- Do not compress the input files



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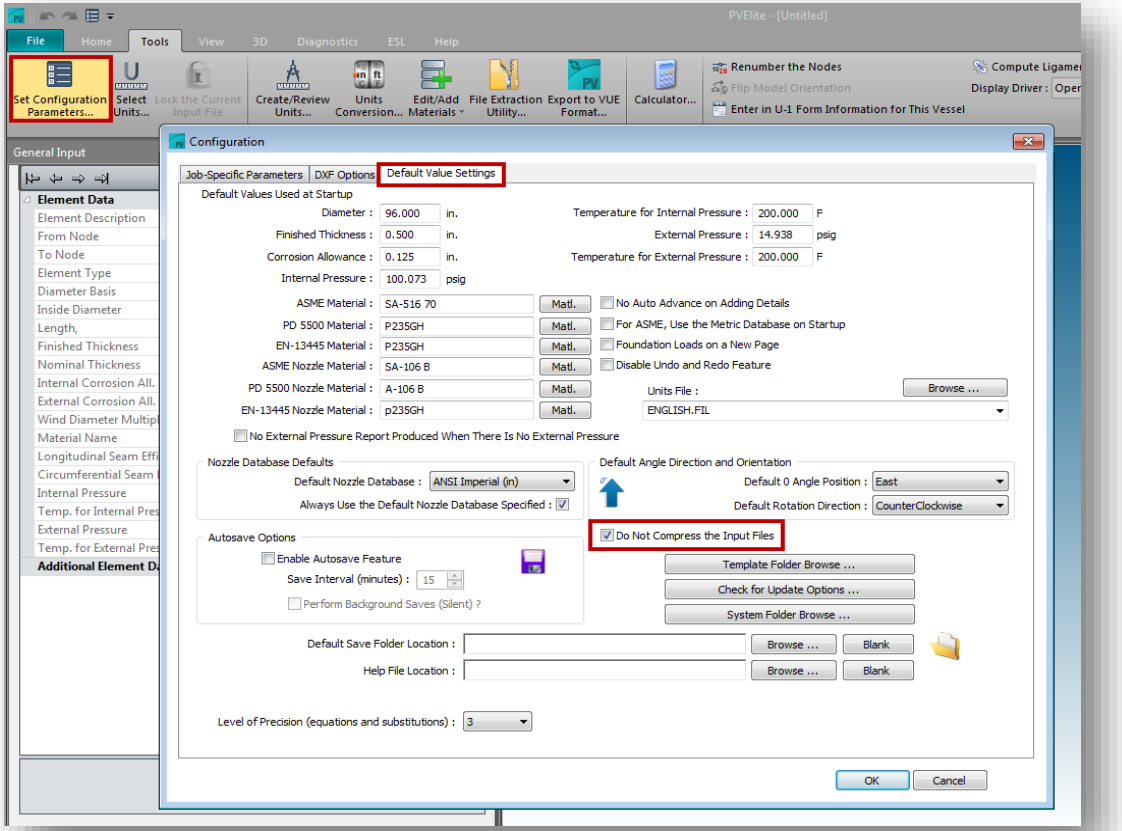
PV Elite Requirements



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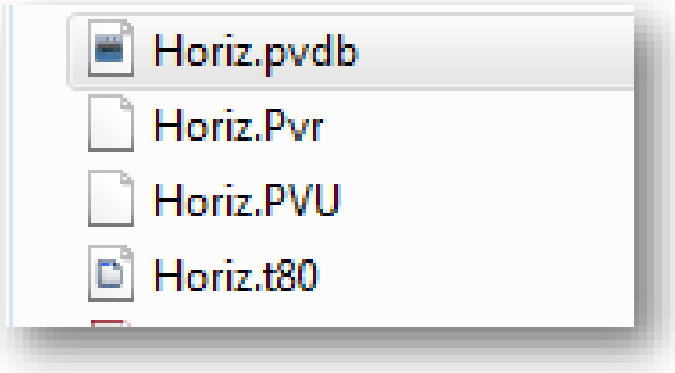
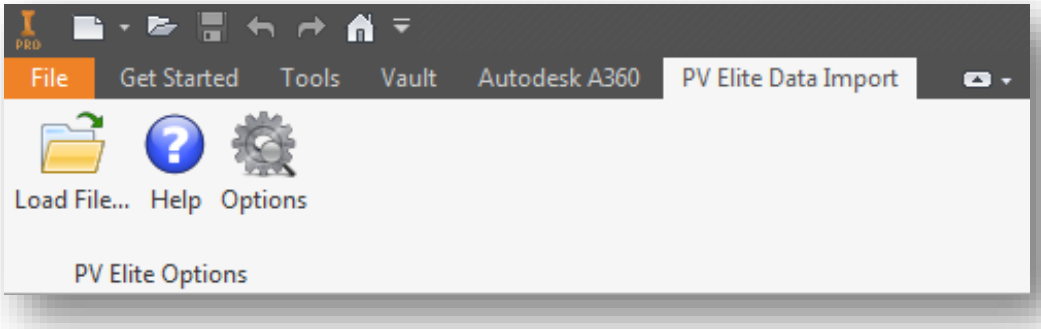
PV Elite Requirements

Getting the data for iProperties, run the analysis to build *.pvu files.



Inventor Interface

Plug in for Autodesk Inventor
Adds a new Ribbon Tab inside Inventor to display PV Elite loading functions



Open a native PV Elite *.pvdb file directly in Inventor environment

Available at no cost to all PV Elite users on maintenance
Will be downloadable from SmartSupport

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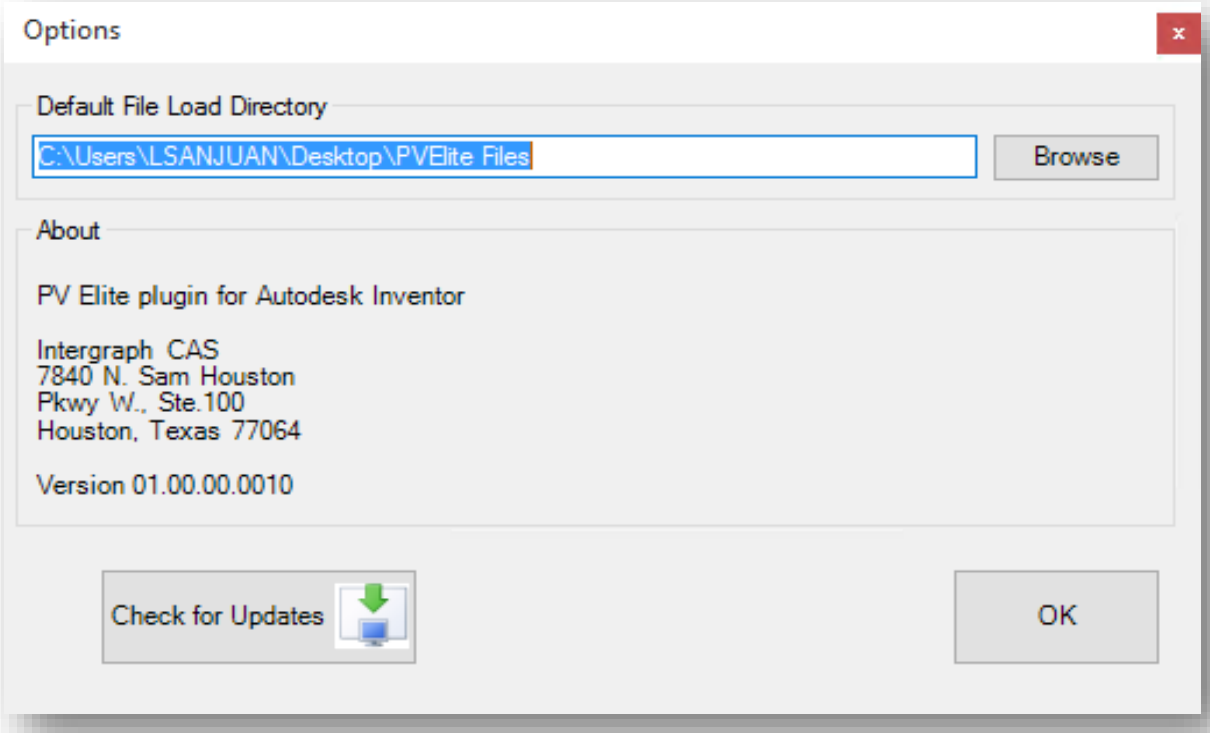
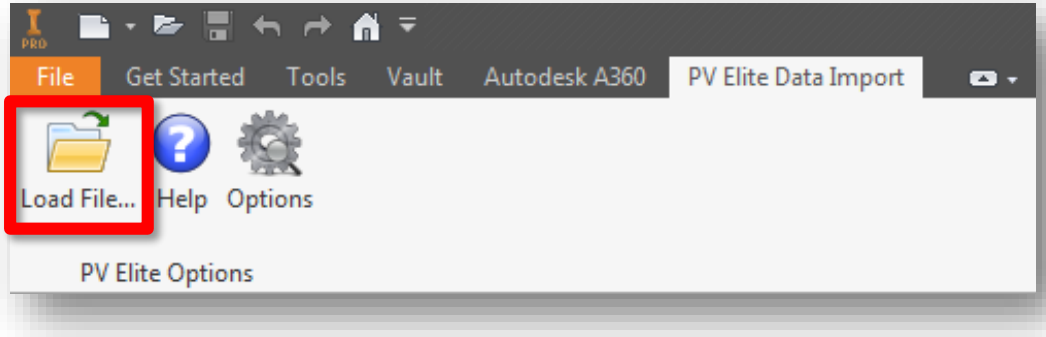
Plug-in UI

Options icon:

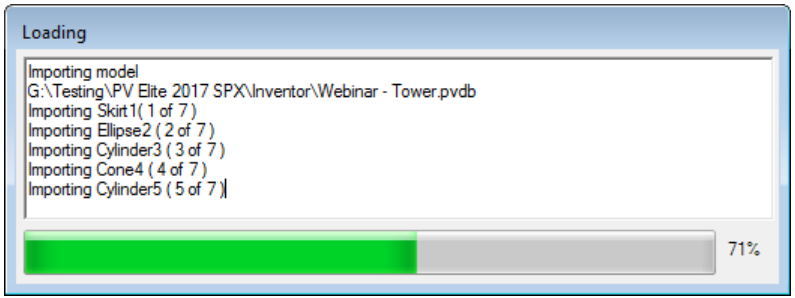


Load a PV Elite file

Basic File Open process for the user

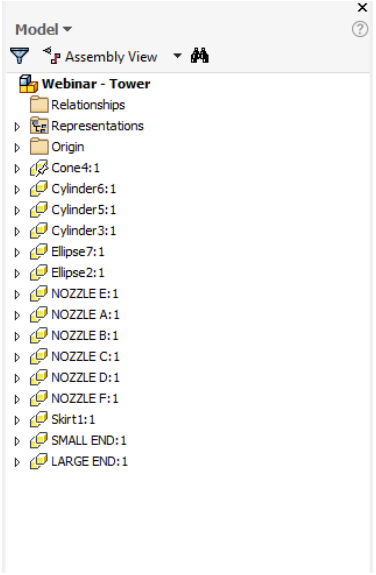


PV Elite File is then loaded and each component is read and natively modelled in the Inventor environment



Load a PV Elite file

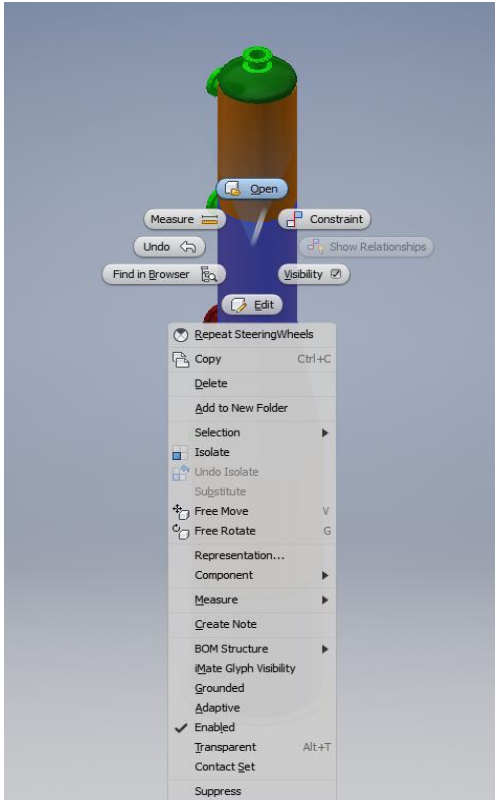
Each PV Elite element and detail is a native Inventor component

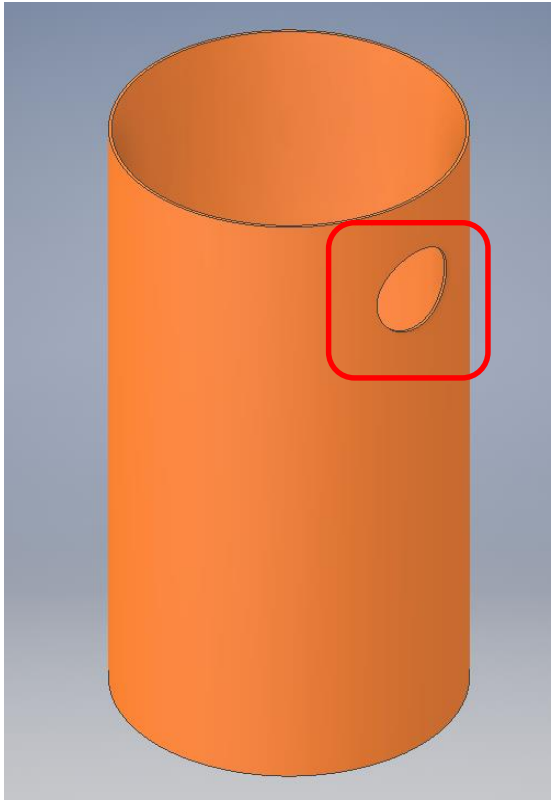


Load a PV Elite file

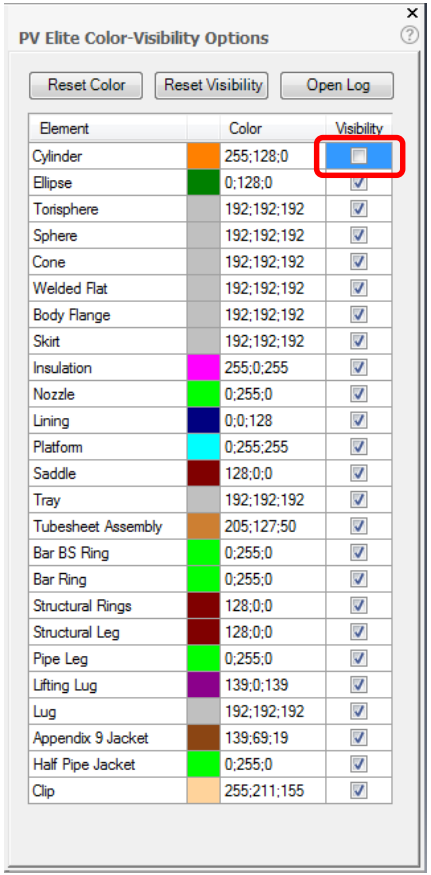
Because everything is native Inventor item each part can be opened individually

Everything behaves as if it was built by the user in Inventor



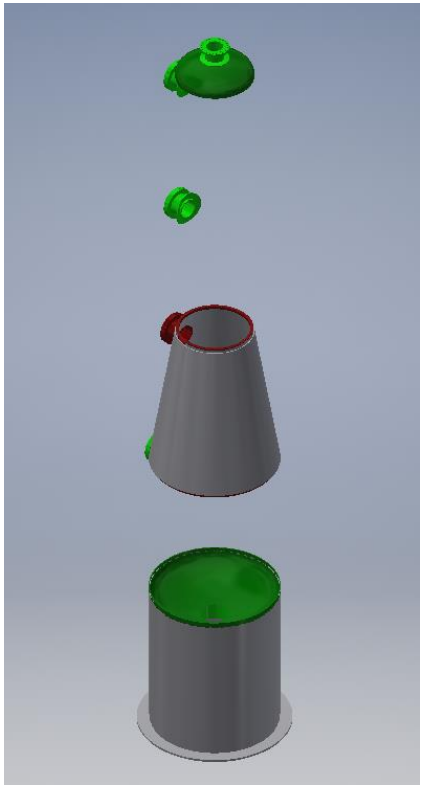


Load a PV Elite file



Colors and visibility for each type of component can be set

Example hide all Cylinders:



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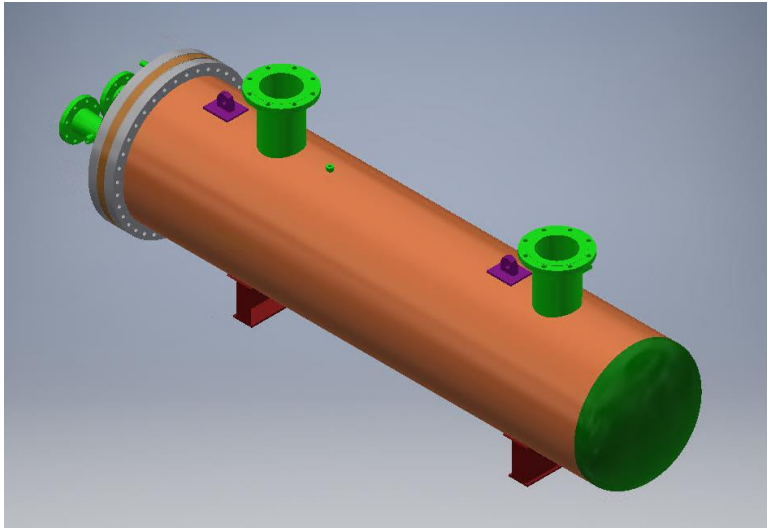
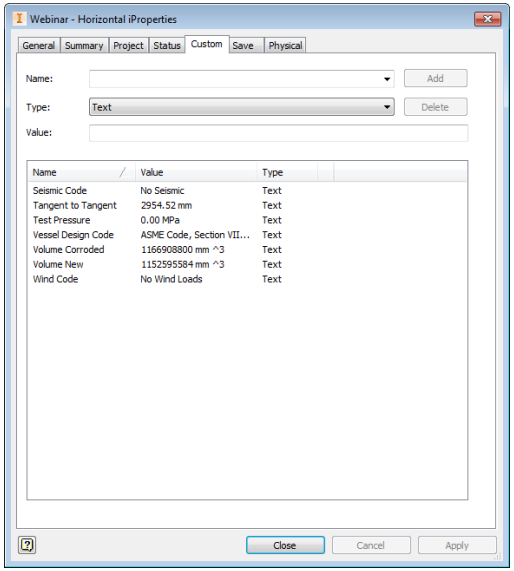
Load a PV Elite file





All PV Elite data is available in Custom properties in Inventor

Overall global data is available for the assembly, some of which is read from the output

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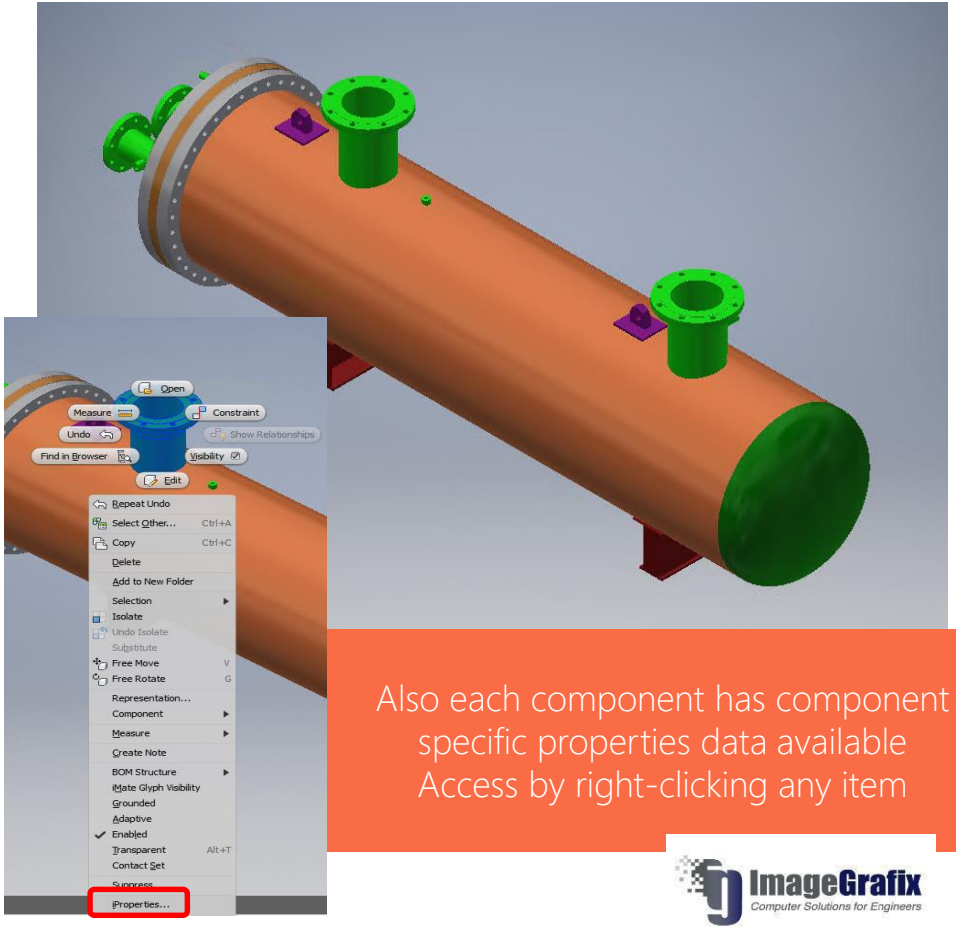
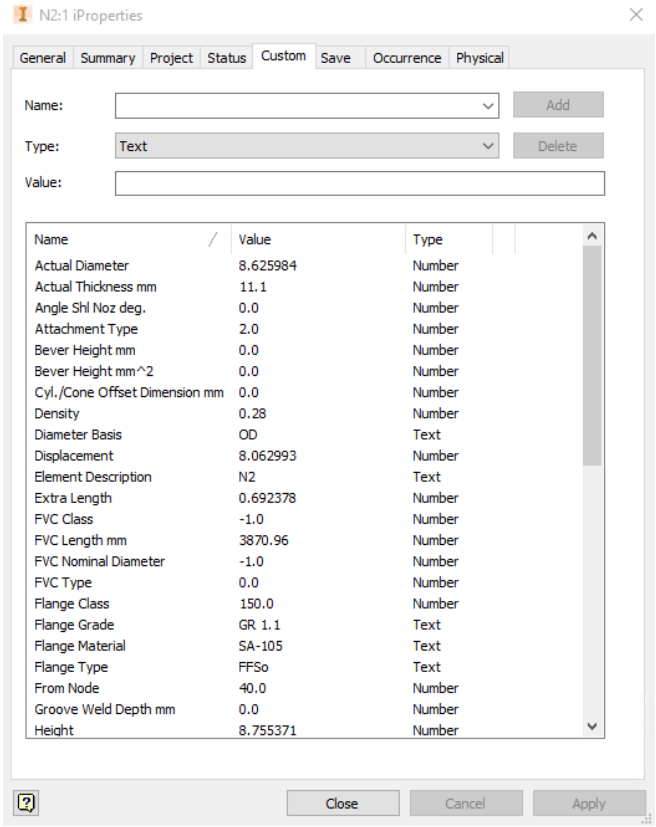
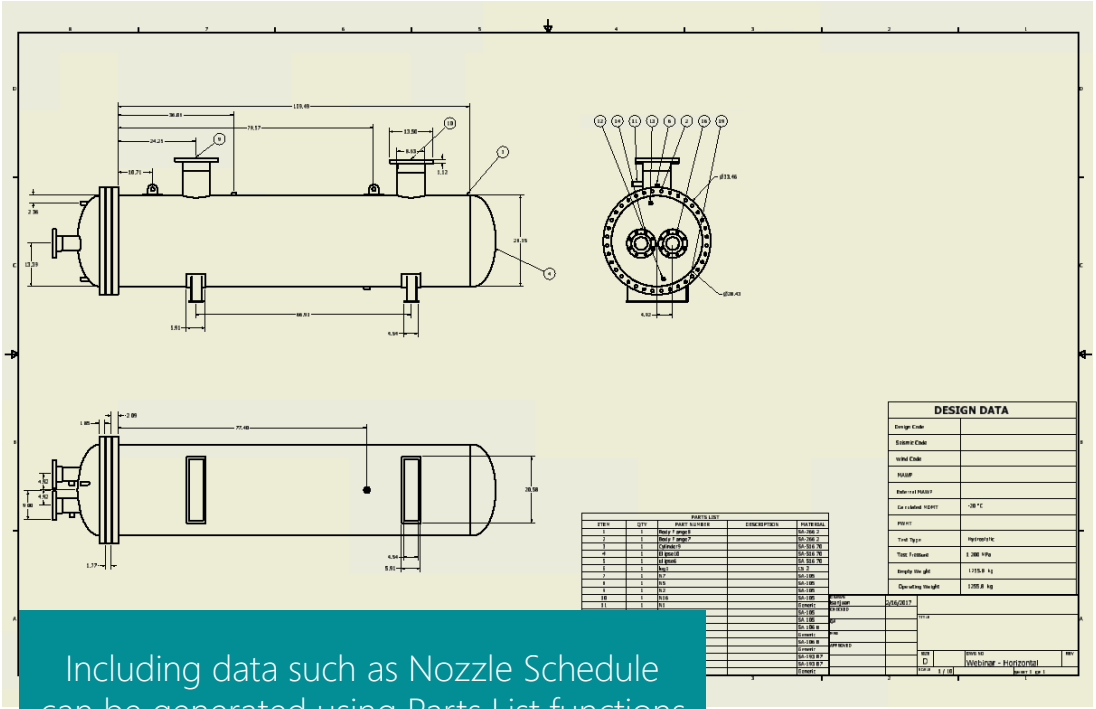
Load a PV Elite file



Also each component has component specific properties data available
Access by right-clicking any item



Drawing Generation



All these properties are available when generating drawings in Inventor

Including data such as Nozzle Schedule can be generated using Parts List functions in Inventor
All data read from PV Elite properties imported

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PARTS LIST

ITEM	QTY	PART NUMBER	DESCRIPTION	MATERIAL
1	1	Body Flange8		SA-266 2
2	1	Body Flange7		SA-266 2
3	1	Cylinder9		SA-516 70
4	1	Ellipse10		SA-516 70
5	1	Ellipse6		SA-516 70
6	1	lug1		CS-2
7	1	N7		SA-105
8	1	N5		SA-105
9	1	N2		SA-105
10	1	N16		SA-105
11	1	N1		Generic
12	1	N9		SA-105
13	1	N8		SA-105
14	1	N45		SA-106 B
15	1	N4		Generic
16	1	N14		SA-106 B
17	1	NJ		Generic
18	1	Sdl2		SA-193 B7
19	1	Sdl1		SA-193 B7
20	1	TS1		Generic

Drawing Generation

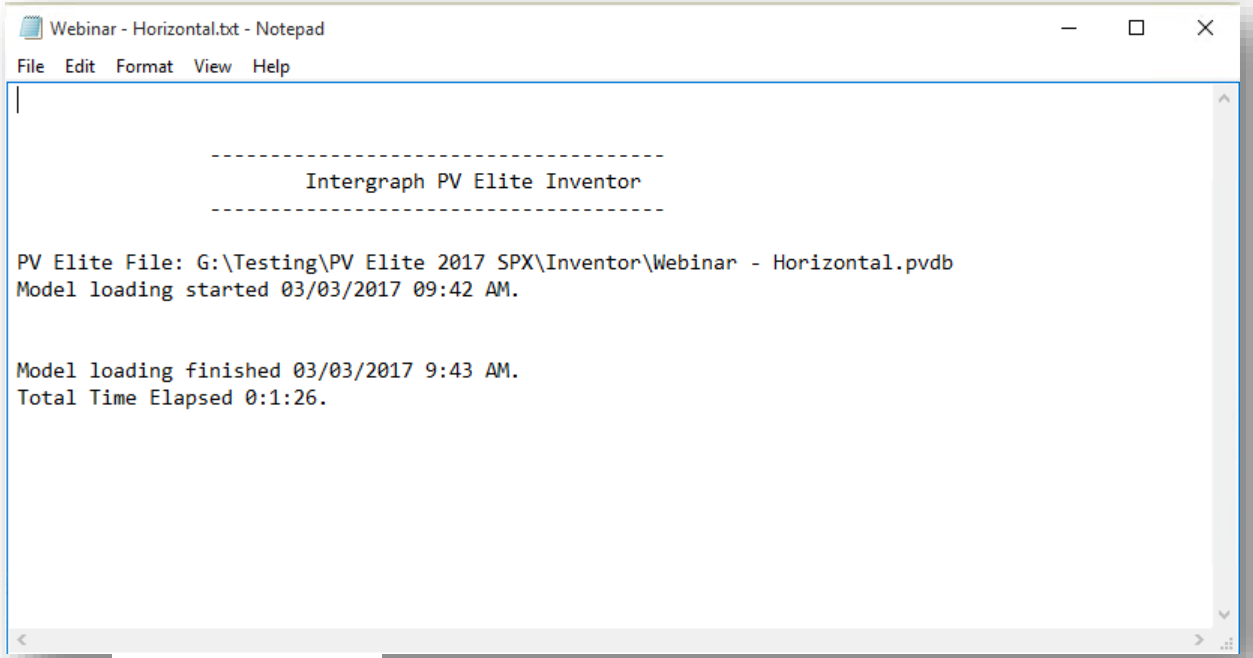
DESIGN DATA	
Design Code	<Design Code>
Seismic Code	<Seismic Code>
Wind Code	<Wind Code>
MAWP	<MAWP>
External MAWP	<External MAWP>
Calculated MDMT	<Channel Side MDMT>
PWHT	<PWHT>
Test Type	<Test Type>
Test Pressure	<Channel Hydro Pressure>
Empty Weight	<Weight Empty>
Operating Weight	<Weight Operating>

Map the imported PV Elite properties to drawings and sketches or tables to populate data on drawings automatically

DESIGN DATA	
Design Code	ASME VIII, Division 1 2015
Seismic Code	ASCE-7 2010
Wind Code	ASCE-7 2010
MAWP	1.1 MPa
External MAWP	1.2 MPa
Calculated MDMT	-20 °C
PWHT	No
Test Type	Hydrostatic
Test Pressure	1.2 MPa
Empty Weight	1255.8 kg
Operating Weight	1255.8 kg

Drawing Generation

Checks are performed during import and recorded in log file if any issues occur



FAQs

Q: How much does the Autodesk Inventor Plugin cost?

A: The Inventor Plugin is free and will be made available to all users who are current on maintenance.

Q: When will this capability be available?

A: This capability is available with the release of PV Elite 2017 SP1.

Q: How do I get this feature?

A: This feature is free and is provided to all users who are current on maintenance. This upgrade can be downloaded by users who are current on maintenance through the Smart Support portal.

Q: What version of the product will this capability run on?

A: You will need to run PV Elite 2017 SP1 and future versions of PV Elite to utilize the full capability of the plugin. We have also tested the plugin with Inventor Professional 2017.

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2017

Thank You