calcgen	**Calcgen Solutions** **Project Specifications**	**Document No.: 1484**	
		Page:	of
VesselExpress			

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Title			
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Revision Log

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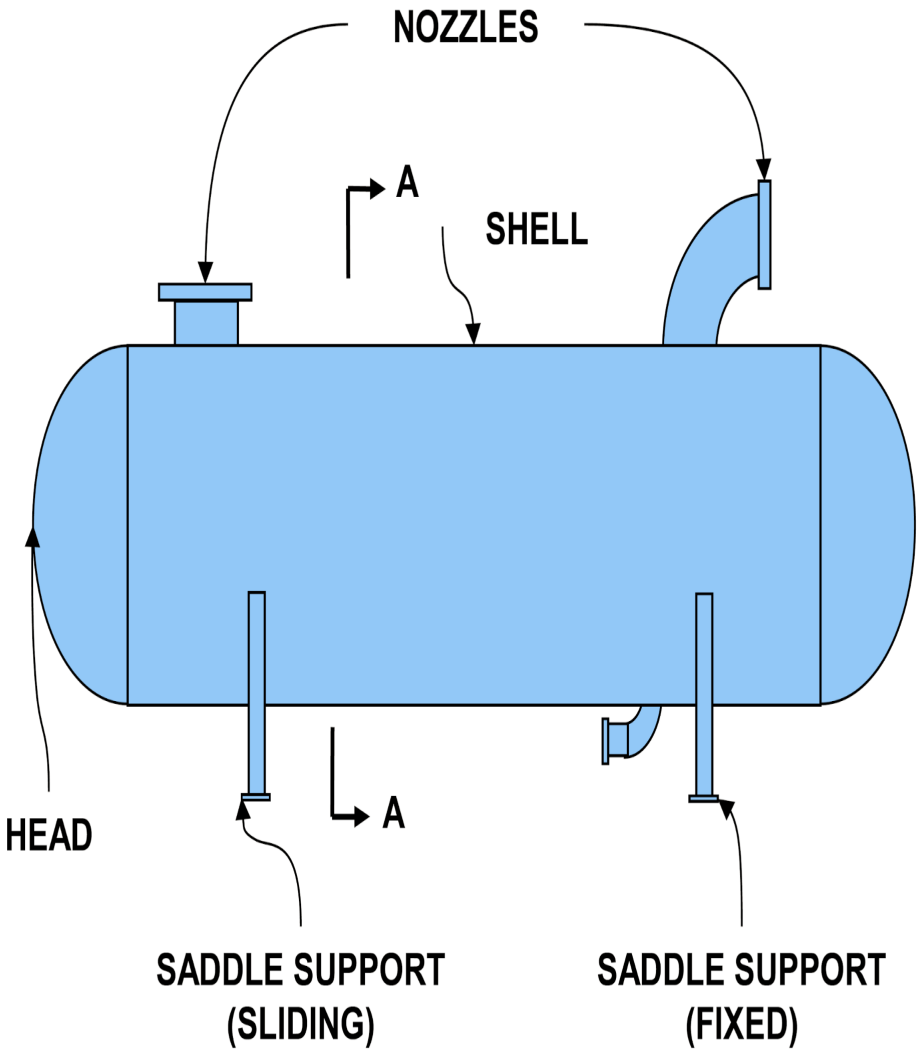
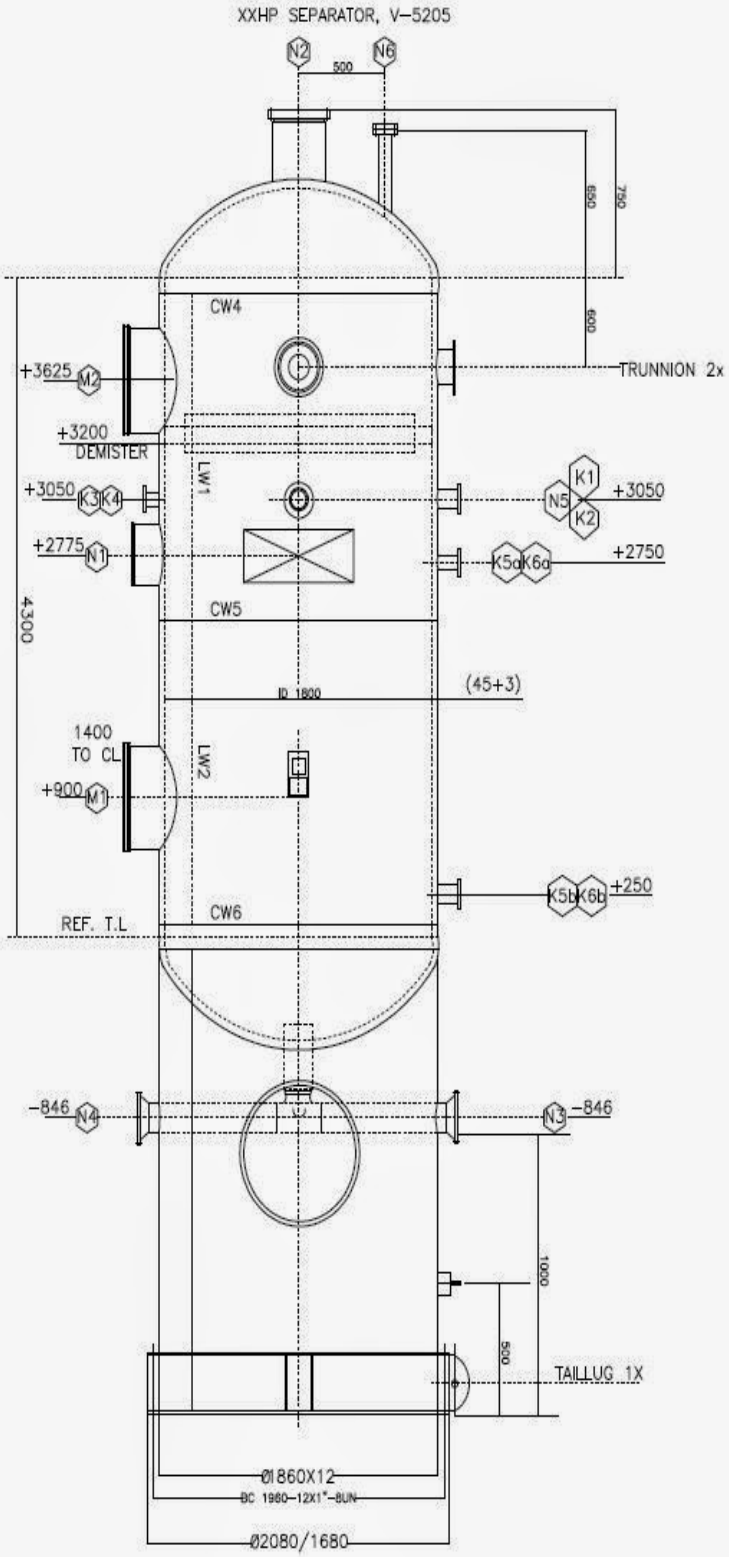
1.0 **Deficiencies Summary**

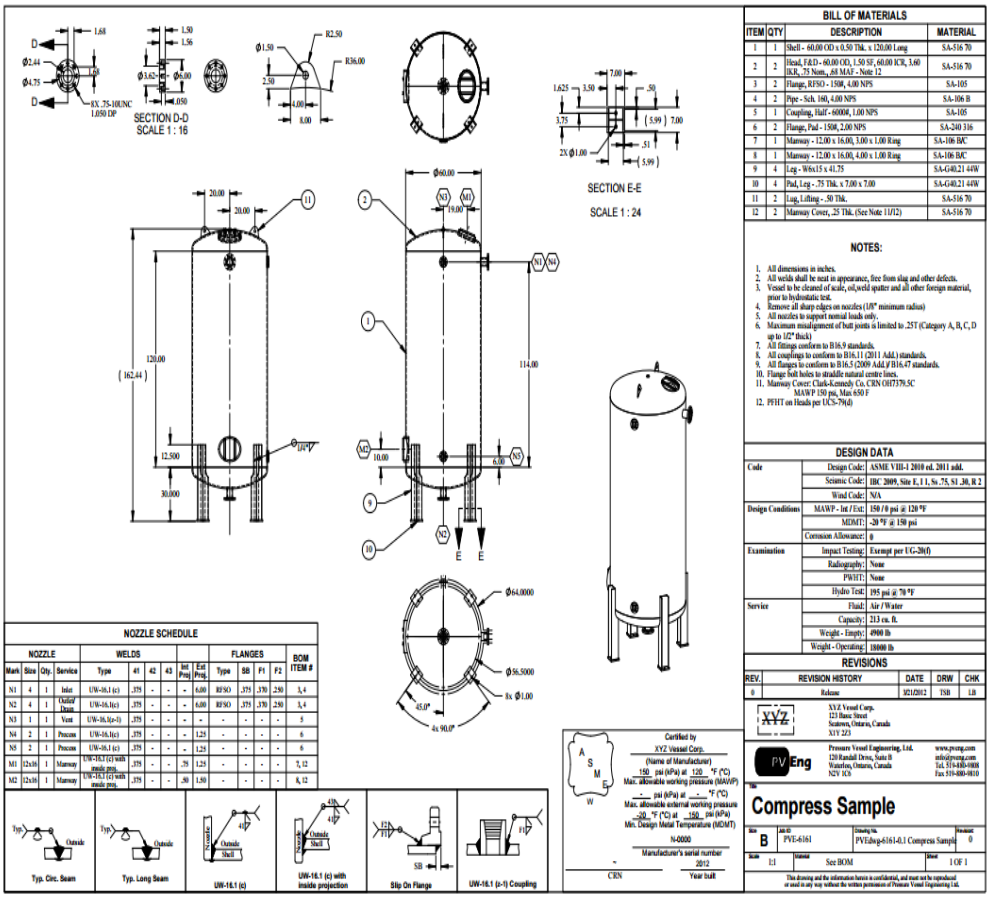
No Deficiencies were found.

2.0 **DEFINITION**





NOTE – ALL DIMENSION IN MILLIMETERS



3.0 **Nozzle Summary**

Nozzle Summary

Dimensions						
Nozzle ID	**Nozzle Mark**	**OD (in)**	**t_n (in)**	**Nominal Shell t(in)**	**Corr(in)**	**A_r**
5		**21.75**	**1.0**		**0.125**	**0.0**

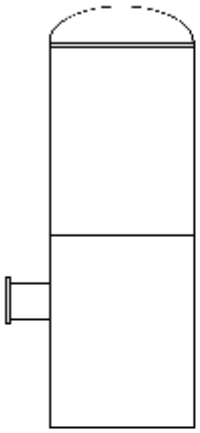
4.0 **PIPE AND FLANGE DATA NEEDED**

Pipe data should come from a pipe chart. A pipe chart like this(link) needs to be available to pull the property based on the pipe and selected pipe schedule. For VesselExpress, we will only use ASME B16.5 welding neck flanges. The flange data is also available on this link. All classes (150, 300, 400, 600, 900, 1500 and 2500) classes of flange data shall be available. The flange dimensions should also be stored on database. The pipe and flange data do not change frequently so it should be on read only database for the users. Admins should be able to modify the information if required. Many other application need to pull these information as well.

5.0 **COMPONENTS REQUIRED**

ASME 2:1 Ellip. Head

Cylinder(s)



Nozzles (Built with Pipe and Flange)

Skirt (Applicable to Vertical Vessel Only)

Saddle (Applicable to Horizontal Vessel Only)

6.0 **OUTPUT REQUIRED**

7.0 **VESSEL CALCULATIONS**

Cylinder1

Cylinder 4512

Thickness of Cylindrical Shell as per UG-27
t = (P*R)/(S*E-0.6*P) = (300.0*36.0)/(17.1*1.0 - 0.6*300.0) = 0.640514184397163in
t = 0.640514184397163 + Corrosion Allowance = 0.640514184397163 + 0.125 = 0.765514184397163in

Cylinder2

Cylinder 4516

Thickness of Cylindrical Shell as per UG-27
t = (P*R)/(S*E-0.6*P) = (300.0*36.0)/(17.1*1.0 - 0.6*300.0) = 0.640514184397163in
t = 0.640514184397163 + Corrosion Allowance = 0.640514184397163 + 0.125 = 0.765514184397163in

Nozzle Calculations

Nozzle1

Nozzle 4519

Parallel Limit of reinforcement per UG-40
L_H = MAX(d, R_n + (t_n - C_n) + (t - C))
= MAX(21.75, 10.875 + (1.0 - 0.125) + (0.125 -))
= 21.75in

Outer Normal Limit of reinforcement per UG-40
L_H = MIN(2.5*(t - C), 2.5*(t_n - C_n) + t_e)
= MIN(2.5*(0.125 - 0.125), 2.5*(1.0 - 0.125) + -0.507389844525392)
= 0.0in

nozzle required thickness per UG-27(c)(1)
t_{rn} = P*R_n / (S_n*E - 0.6*P)
= 45.0*10.875 / (17100.0*1.0 - 0.6*45.0)
= 0.0286636794939378in

Required thickness t_r from UG-37(a)
t_r = P*R_o / (S*E + 0.4*P)
= 45.0*5.125 / (17100.0*1.0 - 0.6*45.0)
= 0.0135081707959937in

Area needs to be increased

Head Calculations

Head1

Head 4517

bottom

Design Internal Thickness for Internal Pressure as per ---
t = P*D_o*K / (2*S*E + 2*P*(K - 0.1)) + Corrosion
= 300.0*72.0*1.0 / (2*17.1*1.0 + 2*300.0*(1.0 - 0.1)) + 0.125
= 1.125in

Head2

Head 4518

bottom

Design Internal Thickness for Internal Pressure as per ---
t = P*D_o*K / (2*S*E + 2*P*(K - 0.1)) + Corrosion
= 300.0*72.0*1.0 / (2*17.1*1.0 + 2*300.0*(1.0 - 0.1)) + 0.125
= 1.125in

Skirt Calculations

Lifting Lug Calculations

MAWP

Weight of Pressure Vessel (entire Weight)

Center of Gravity with Fluid or without fluid

Nozzle Schedule Table

An outline drawing

AREA

	Abbreviation	Unit
0	km²	square kilometer
1	m²	square meter
2	dm²	square decimeter
3	cm²	square centimeter
4	mm²	square millimeter
5	ha	hectare
6	a	are
7	ca	centiare
8	mile²	square mile
9	in²	square inch
10	yd²	square yard
11	ft²	square foot
12	ro	rood
13	acre	acre
14	nautical mile²	square nautical mile

TEMP

	Abbreviation	Unit
0	°C	Celsius
1	°F	Fahrenheit
2	K	Kelvin
3	°Ré	Reaumur
4	°N	Newton
5	°Ra	Rankine

ANGLE

	bbreviation	Unit
0	°	Degree
1	grad(gon)	Grad
2	Angular mil	Angular mil
3	'	Minute of arc
4	rad	Radian
5	''	Second of arc

DISTANCE

	Abbreviation	Unit
0	km	kilometer
1	m	meter
2	dm	decimeter
3	cm	centimeter
4	mm	millimeter
5	mi	mile
6	in	inch
7	ft	foot
8	yd	yard
9	nautical mile	nautical mile

FREQUENCY

	Abbreviation	Unit
0	Hz	Hertz
1	KHz	Kilohertz
2	MHz	Megahertz
3	GHz	Gigahertz

MAX

	2	SA-516	Carbon Steel	Plate	60	K02100	none	none.1	1	1.1	60.1	32	850	700	1000	650	CS-2	G10, S1, T2	17.1	17.1.1	17.1.2	0	17.1.3	17.1.4	17.1.5	16.4	15.8	1
0	3	SA-516	Carbon Steel	Plate	55	K01800	none	none	1	1	55	30	850	700	1000	650	CS-2	G10, S1, T2	15.7	15.7	15.7	0	15.7	15.7	15.7	15.3	14.8	1

PIPE

	4	0.125	0.405	0.307	10S	0.049	0.1863
0	5	0.125	0.405	0.269	40	0.068	0.2447
1	6	0.125	0.405	0.269	STD	0.068	0.2447
2	7	0.250	0.540	0.410	10	0.065	0.3297
3	8	0.250	0.540	0.410	10S	0.065	0.3297
4	9	0.250	0.540	0.364	40	0.088	0.4248
5	10	0.250	0.540	0.364	STD	0.088	0.4248

PRESSURE

	Abbreviation	Unit
0	psi	Pound Per Square Inch
1	in Hg	Inch of Mercury
2	mm Hg	Millimeters of Mercury
3	ft H2O	Ftch of Mercury
4	in H2O	Milimiters of Mercury
5	torr	Torr
6	atm	Atmosphere
7	bar	Bar
8	mbar	millibar
9	kg / cm2	kg per square centimeter
10	kPa	kilopascal
11	Pa	pascal

WEIGHT

	Abbreviation	Unit
0	t	tonne
1	kg	kilogram
2	hg	hectogram
3	g	gram
4	dg	decigram
5	cg	centigram
6	mg	milligram
7	µg	microgram
8	carat	carat
9	grain	grain
10	oz (av)	ounce avoirdupois
11	lb (av)	pound avoirdupois
12	cwt(UK)	long hundredweight
13	cwt(US)	short hundredweight
14	ton(UK)	long ton
15	ton(US)	short ton
16	st(UK)	stone

SPEED

	Abbreviation	Unit
0	km/h	kilometer per hour
1	m/s	meter per second
2	mph	mile per hour

VOLUME

	Abbreviation	Unit
0	m^3	cubic meter
1	dm^3	cubic decimeter
2	cm^3	cubic centimeter
3	l	liter
4	dl	deciliter
5	cl	centiliter
6	ml	milliliter
7	fl oz(UK)	fluid ounce(UK)
8	fl oz(US)	fluid ounce(US)
9	in^3	cubic inch
10	ft^3	cubic foot
11	yd^3	cubic yard
12	gal(UK)	gallon uk

	Abbreviation	Unit
13	gal(US)	gallon us
14	bbl	petroleum barrel
15	pt(Imp)	pint(UK)
16	pt(US fl)	fluid pint(US)
17	pt(US dry)	dry pint(US)