

Company Name -

Client :GÜVEN SOGUTMA

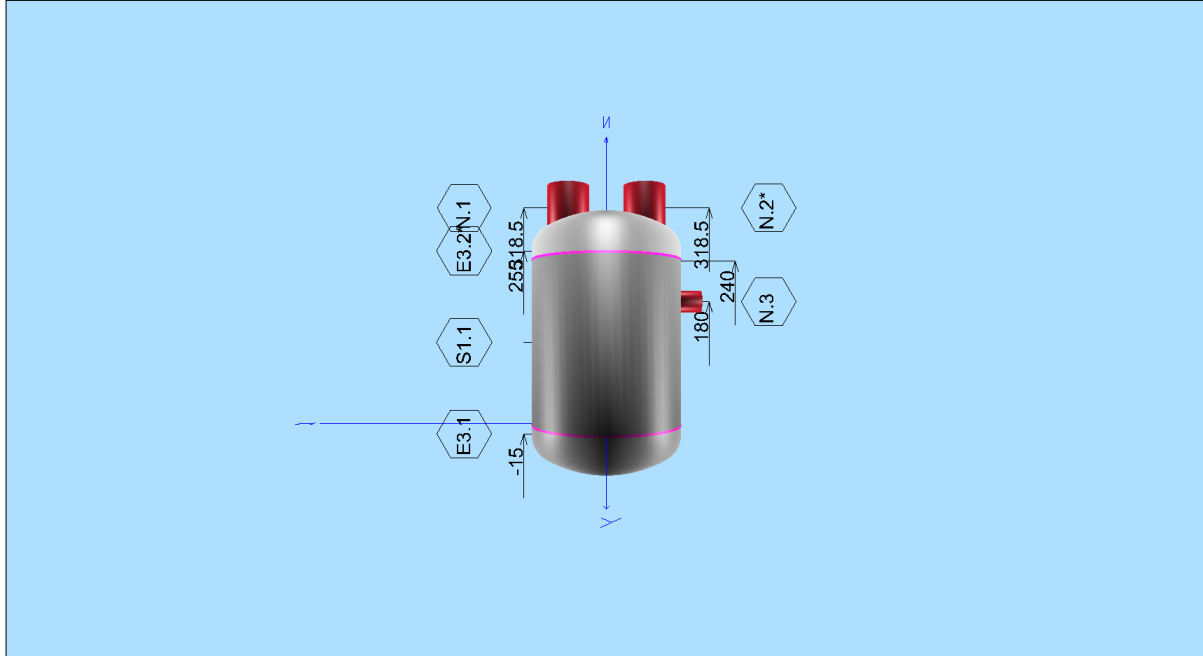
Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator :

Rev.:A

(0) Drawing

3D View of Vessel (alter by using the Save User Specified View command)



Design Data & Process Information

Description	Units	Design Data
Process Card		General Design Data
Design Code & Specifications		EN13445 TG = 3b
Internal Design Pressure (MPa)	MPa	3.3
External Design Pressure (MPa)	MPa	
Hydrotest Pressure (MPa)	MPa	
Maximum Design Temperature (°C)	°C	130
Minimum Design Temperature (°C)	°C	-20
Operating Temperature (°C)	°C	
Corrosion Allowance (mm)	mm	0.5
Content of Vessel		
Specific Density of Oper.Liq		
Normal Liquid Level NLL (mm)	mm	

Utilization Chart

Utilization Chart

Company Name -

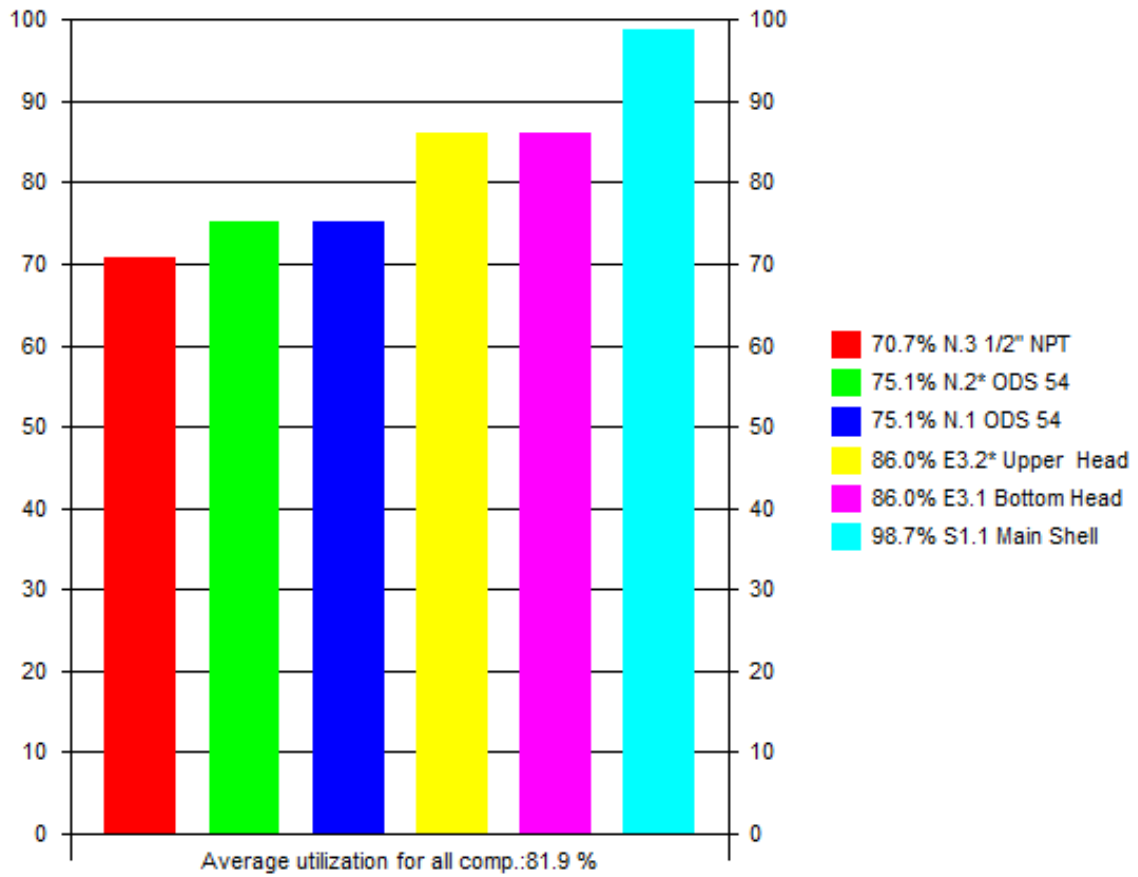
Client :GÜVEN SOGUTMA

Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator :

Rev.:A

IPONENTS UTILIZATION CHART - Client :GÜVEN SOGUTMA Vessel Tag No.:SLA.33B.54.1



Maximum Utilization of 98.7% for Component S1.1 Main Shell - VVD by Hexagon PPM, Ver:20.0

Welding Information

EN1708-1 Welding Requirements for Pressurized Components

NOTE: No welding information has been specified by the user.

Company Name -

Client :GÜVEN SOGUTMA Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 7.4.2 CYLINDRICAL SHELL

S1.1 Main Shell 01 June 2023 09:01

INPUT DATA

COMPONENT ATTACHMENT/LOCATION

Distance from end of cylinder to ref. DATUM LINE....:mm 0.00 mm

GENERAL DESIGN DATA

PRESSURE LOADING: Design Component for Internal Pressure Only

PROCESS CARD:

General Design Data : Temp= 130°C, P=3.3000 MPa, c=0.5 mm, Pext=0.0000 MPa

SPECIFIC DENSITY OF OPERATING LIQUID.....:SG 0.00

LIQUID HEAD.....:LH 0.00 mm

SHELL DATA

CYLINDER FABRICATION: Welded Pipe

WELD JOINT COEFFICIENT: Testing Group 3 (z=0.85)

NEGATIVE TOLERANCE: Negative tolerance specified in mm

EN 10217-3:2019, 1.0565 P355NH welded tube, HT:N THK<=20mm 130'C

Rm=490 Rp=355 Rpt=292 f=194.67 f20=204.17 ftest=338.1 E=203868(N/mm2) ro=7.85

OUTSIDE DIAMETER OF SHELL.....:De 219.00 mm

LENGTH OF CYLINDRICAL PART OF SHELL.....:Lcyl 240.00 mm

NOMINAL WALL THICKNESS (uncorroded).....:en 3.0000 mm

NEGATIVE TOLERANCE/THINNING ALLOWANCE.....:th 0.3000 mm

Split shell into several shell courses and include welding information: NO

WELDING REQUIREMENTS TO EN 1708-1:2010

Comment(Optional):

Type of welded connection: Not Applicable

CALCULATION DATA

7.4.2 - CYLINDRICAL SHELLS UNDER INTERNAL PRESSURE

Required Minimum Shell Thickness Excl.Allow. emin :

$$emin = De * P / (2 * f * z + P) \quad (7.4-2)$$
$$= 219 * 3.3 / (2 * 194.67 * 0.85 + 3.3) = 2.1622 \text{ mm}$$

Required Minimum Shell Thickness Incl.Allow. :

$$emina = emin + c + NegDev = 2.16 + 0.5 + 0.3 = 2.9622 \text{ mm}$$

Analysis Thickness

$$ea = en - c - NegDev = 3 - 0.5 - 0.3 = 2.2000 \text{ mm}$$

»7.4.1 Cond.of Applicability $emin/De=0.0099 \leq 0.16$ » OK«

Internal Pressure $emina=2.96 \leq en=3$ [mm]	98.7%	OK
---	-------	----

MAXIMUM ALLOWABLE WORKING PRESSURE MAWP :

Inside Diameter of Shell

$$Di = De - 2 * ea = 219 - 2 * 2.2 = 214.60 \text{ mm}$$

Mean Diameter of Shell

$$Dm = (De + Di) / 2 = (219 + 214.6) / 2 = 216.80 \text{ mm}$$

MAWP HOT & CORR. (Corroded condition at design temp.)

$$MAWPHC = 2 * f * z * ea / Dm = 2 * 194.67 * 0.85 * 2.2 / 216.8 = 3.3582 \text{ MPa}$$

MAWP NEW & COLD (Uncorroded condition at ambient temp.)

$$MAWPNC = 2 * f20 * z * (ea + c) / Dm$$
$$= 2 * 204.17 * 0.85 * (2.2 + 0.5) / 216.8 = 4.3226 \text{ MPa}$$

MAX TEST PRESSURE (Uncorroded cond.at ambient temp.)

Ptmax = 2 * ftest * ztest * (ea + c) / Dm

$$= 2 * 338.1 * 1 * (2.2 + 0.5) / 216.8 = 8.4213 \text{ MPa}$$

Company Name -

Client :GÜVEN SOGUTMA

Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 7.4.2 CYLINDRICAL SHELL

S1.1 Main Shell 01 June 2023 09:01

EN13445-5;10.2.3.3 REQUIRED MIN.HYDROSTATIC TEST PRESSURE:Ptmin

NEW AT AMBIENT TEMP. FOR TEST GROUPS 1, 2 and 3

$$Ptmin = 1.25 * Pd * f_{20} / f = 1.25 * 3.3 * 204.17 / 194.67 = 4.3263 \text{ MPa}$$

$$Ptmin = 1.43 * Pd = 1.43 * 3.3 = 4.7190 \text{ MPa}$$

Test Pressure Ptmin=4.72 <= Pmax=8.42[MPa]**56.0%****OK****MAXIMUM DIAMETER OF UNREINFORCED OPENING IN SHELL**

Inside Radius of Shell

$$r_{is} = D_i / 2 \text{ (9.5-3)} = 214.6 / 2 = 107.30 \text{ mm}$$

Length of Shell Contributing to Reinforcement

$$I_s = \text{Sqr}((2 * r_{is} + e_a) * e_a) \text{ (9.5-2)}$$

$$= \text{Sqr}((2 * 107.3 + 2.2) * 2.2) = 21.84 \text{ mm}$$

Maximum Diameter of Unreinforced Opening in Shell Checked to Rules in Section 9

$$d_{max1} = \text{MIN}(0.5 * D_i, (e_a * I_s * (f - 0.5 * P) / (P - r_{is} * I_s)) / (0.5 * r_{is} + 0.5 * e_a)) \text{ (9.5-7,22,23)}$$

$$= \text{MIN}(0.5 * 214.6, (2.2 * 21.84 * (194.67 - 0.5 * 3.3) / (3.3 - 107.3 * 21.84)) / (0.5 * 107.3 + 0.5 * 2.2)) = 8.5283 \text{ mm}$$

Maximum diameter of Opening Not Requiring Reinforcement Check

$$d_{max2} = 0.15 * \text{Sqr}((2 * r_{is} + e_a) * e_a) \text{ (9.5-18)}$$

$$= 0.15 * \text{Sqr}((2 * 107.3 + 2.2) * 2.2) = 3.2759 \text{ mm}$$

Maximum Diameter of Unreinforced Opening

$$d_{max} = \text{MAX}(d_{max1}, d_{max2}) = \text{MAX}(8.53, 3.28) = 8.5283 \text{ mm}$$

CALCULATION SUMMARY**7.4.2 - CYLINDRICAL SHELLS UNDER INTERNAL PRESSURE**Required Minimum Shell Thickness Excl.Allow. e_{min} :

$$e_{min} = D_e * P / (2 * f * z + P) \text{ (7.4-2)}$$

$$= 219 * 3.3 / (2 * 194.67 * 0.85 + 3.3) = 2.1622 \text{ mm}$$

Required Minimum Shell Thickness Incl.Allow. :

$$e_{min_a} = e_{min} + c + \text{NegDev} = 2.16 + 0.5 + 0.3 = 2.9622 \text{ mm}$$

Internal Pressure e_{min_a} =2.96 <= e_n =3[mm]**98.7%****OK****MAX TEST PRESSURE (Uncorroded cond.at ambient temp.)**

$$P_{tmax} = 2 * f_{test} * z_{test} * (e_a + c) / D_m$$

$$= 2 * 338.1 * 1 * (2.2 + 0.5) / 216.8 = 8.4213 \text{ MPa}$$

EN13445-5;10.2.3.3 REQUIRED MIN.HYDROSTATIC TEST PRESSURE:Ptmin

NEW AT AMBIENT TEMP. FOR TEST GROUPS 1, 2 and 3

$$Ptmin = 1.25 * Pd * f_{20} / f = 1.25 * 3.3 * 204.17 / 194.67 = 4.3263 \text{ MPa}$$

$$Ptmin = 1.43 * Pd = 1.43 * 3.3 = 4.7190 \text{ MPa}$$

Test Pressure Ptmin=4.72 <= Pmax=8.42[MPa]**56.0%****OK****MAXIMUM DIAMETER OF UNREINFORCED OPENING IN SHELL**

Maximum Diameter of Unreinforced Opening

$$d_{max} = \text{MAX}(d_{max1}, d_{max2}) = \text{MAX}(8.53, 3.28) = 8.5283 \text{ mm}$$

Volume:0.0087 m³ Weight:3.8 kg (SG= 7.85)

Company Name -

Client :GÜVEN SOGUTMA

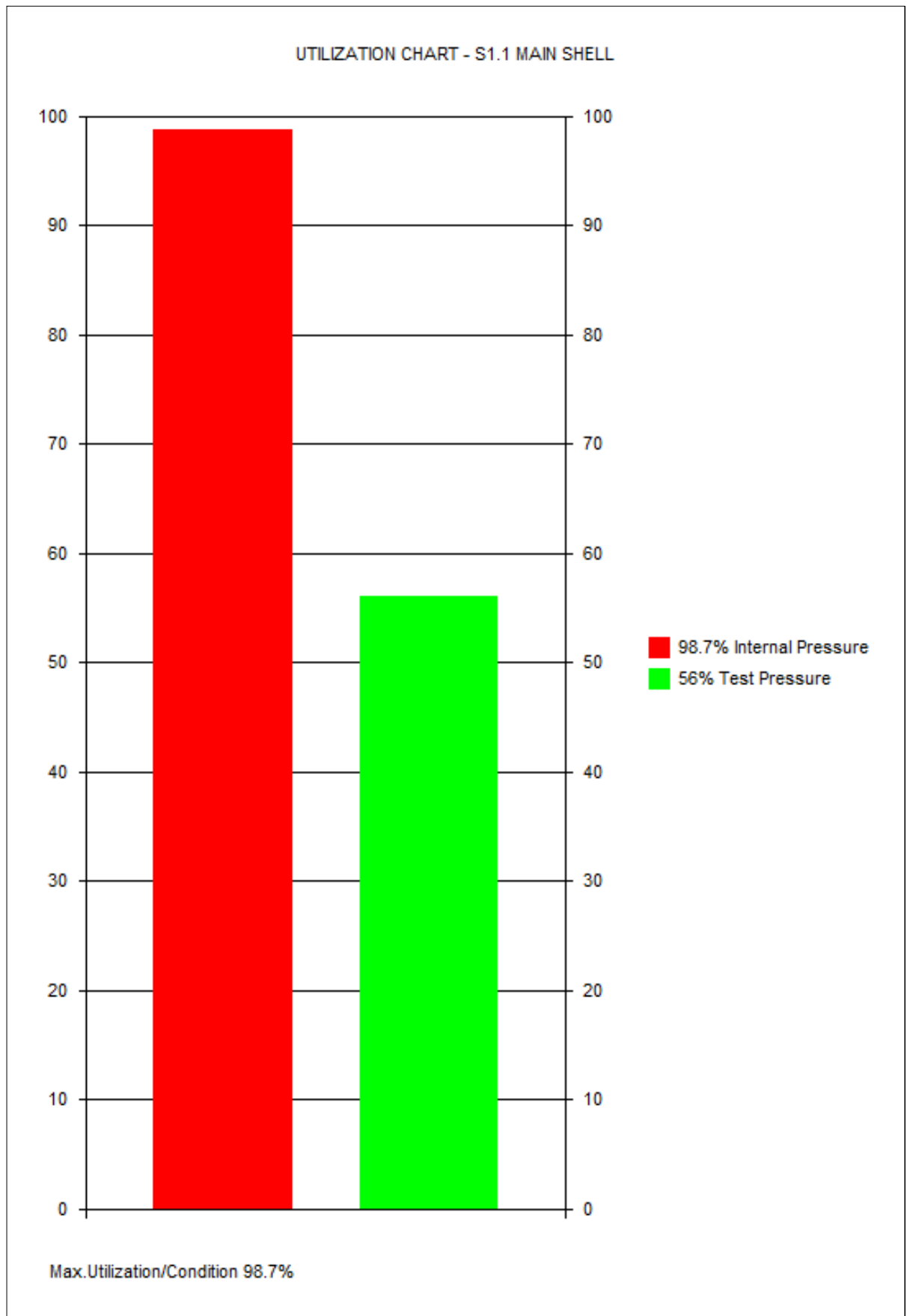
Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 7.4.2 CYLINDRICAL SHELL

S1.1 Main Shell

01 June 2023 09:01



Company Name -

Client :GÜVEN SOGUTMA

Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 7.5 DOMED ENDS

E3.1 Bottom Head 01 June 2023 09:03 ConnID:S1.1

INPUT DATA

COMPONENT ATTACHMENT/LOCATION

Attachment: S1.1 Cylindrical Shell Main Shell
Location: Along z-axis zo= 0

GENERAL DESIGN DATA

PRESSURE LOADING: Design Component for Internal Pressure Only

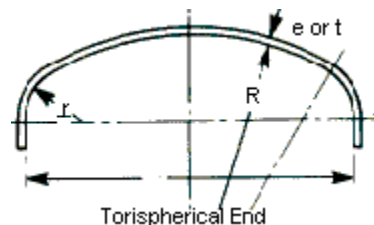
PROCESS CARD:

General Design Data : Temp= 130°C, P=3.3000 MPa, c=0.5 mm, Pext=0.0000 MPa

SPECIFIC DENSITY OF OPERATING LIQUID.....:SG 0.00

LIQUID HEAD.....:LH 0.00 mm

DIMENSIONS OF END



Type of Torispherical End: Dished End KORBOGEN DIN 28013-28014/SMS 482

WELD JOINT COEFFICIENT: Unwelded Component (z=1.0)

OUTSIDE DIAMETER OF CYLINDRICAL FLANGE OF END.....:De 219.00 mm

LENGTH OF CYLINDRICAL FLANGE OF END.....:Lcyl 15.00 mm

NEGATIVE TOLERANCE/THINNING ALLOWANCE.....:th 0.3000 mm

NOMINAL THICKNESS OF HEAD/END (uncorroded).....:en 3.0000 mm

Include calculation of forming during fabrication to EN13445-4 Section 9.: NO

MATERIAL DATA FOR END

EN 10028-2:2017, 1.0473 P355GH plate and strip, HT:N THK<=16mm 130'C

Rm=510 Rp=355 Rpt=308.6 f=205.73 f20=212.5 ftest=338.1 E=203868(N/mm2) ro=7.85

Material & Delivery Form: NOT Cold Spun Seamless Austenitic Stainless Steel

NOZZLES IN KNUCKLE REGION TO SECTION 7.7

Nozzles In Knuckle Region: NO

WELDING REQUIREMENTS TO EN 1708-1:2010

Comment(Optional):

Type of welded connection: Not Applicable

CALCULATION DATA

7.5.3 - TORISPHERICAL ENDS UNDER INTERNAL PRESSURE

7.5.3.2 Required Minimum End Thickness

Required Thickness of End to Limit Membrane Stress in Central Part

$$e_s = P * R / (2 * f * z - 0.5 * P) \quad (7.5-1)$$

$$= 3.3 * 175.2 / (2 * 205.73 * 1 - 0.5 * 3.3) = 1.4108 \text{ mm}$$

$$f_b = R_{pt} / 1.5 \quad (7.5-4) = 308.6 / 1.5 = 205.73 \text{ N/mm}^2$$

Required Thickness of Knuckle to Avoid Plastic Buckling

$$e_b = (0.75 * R + 0.2 * D_i) * ((P / (111 * f_b)) * (D_i / r)^{0.825})^{(0.667)} \quad (7.5-3)$$

$$= (0.75 * 175.2 + 0.2 * 214) * ((3.3 / (111 * 205.73)) * (214 / 33.726)^{0.825})^{(0.667)}$$

$$= 1.3221 \text{ mm}$$

7.5.3.5 Formulas for Calculation of Factor Beta

$$Y = \text{MIN}(e_{min} / R, 0.04) \quad (7.5-9) = \text{MIN}(1.77 / 175.2, 0.04) = 0.0101$$

$$Z = \text{LOG}(1 / Y) \quad (7.5-10) = \text{LOG}(1 / 0.0101) = 1.9953$$

$$X = r / D_i \quad (7.5-11) = 33.726 / 215.46 = 0.1565$$

Company Name -

Client :GÜVEN SOGUTMA

Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 7.5 DOMED ENDS

E3.1 Bottom Head 01 June 2023 09:03 ConnID:S1.1

$$N = 1.006 - 1 / (6.2 + (90 * Y) ^ 4) \quad (7.5-12)$$

$$=1.006-1/(6.2+(90*0.0101)^4)= \quad 0.8608$$

$$\text{Beta01} = N * (-0.1833 * Z^3 + 1.0383 * Z^2 - 1.2943 * Z + 0.837) \quad (7.5-15)$$

$$=0.8608 * (-0.1833 * 2.^3 + 1.0383 * 2.^2 - 1.2943 * 2. + 0.837) = \quad 0.8023$$

$$\text{Beta02} = \text{MAX}(0.5, 0.95 * (0.56 - 1.94 * Y - 82.5 * Y ^ 2)) \quad (7.5-17)$$

$$=\text{MAX}(0.5, 0.95 * (0.56 - 1.94 * 0.0101 - 82.5 * 0.0101^2)) = \quad 0.5054$$

$$\text{beta} = 10 * ((0.2 - X) * \text{Beta01} + (X - 0.1) * \text{Beta02}) \quad (7.5-16)$$

$$=10 * ((0.2 - 0.1565) * 0.8023 + (0.1565 - 0.1) * 0.5054) = \quad 0.6344$$

Required Thickness of Knuckle to Avoid Axisymmetric Yielding

$$e_y = \text{beta} * P * (0.75 * R + 0.2 * D_i) / f \quad (7.5-2)$$

$$=0.6344 * 3.3 * (0.75 * 175.2 + 0.2 * 215.46) / 205.73 = \quad 1.7758 \text{ mm}$$

NOTE 3, since $e_y(1.8) > 0.005 * D_i(1.1)$ it is NOT necessary to calculate/consider eb.

Required Minimum End Thickness Excl.Allow. e_{min} :

$$e_{min} = e_{min} = 1.78 =$$

1.7758 mm

Required Minimum End Thickness Incl.Allow. :

$$e_{minA} = e_{min} + c + t_h = 1.78 + 0.5 + 0.3 =$$

2.5800 mm

Internal Pressure $e_{minA}=2.58 \leq e_n=3$[mm]	86.0%	OK
--	--------------	-----------

Analysis Thickness

$$e_a = e_n - c - t_h = 3 - 0.5 - 0.3 =$$

2.2000 mm

Inside Diameter of Shell

$$D_i = D_e - 2 * (e_n - c) = 219 - 2 * (3 - 0.5) =$$

214.00 mm

Mean Diameter of Shell

$$D_m = (D_e + D_i) / 2 = (219 + 214) / 2 =$$

216.50 mm

7.5.3.4 - Required Minimum Thickness of Straight Cylindrical Flange

$$L_{lim} = 0.2 * \text{SQRT}(D_i * e_{min}) = 0.2 * \text{SQRT}(214 * 1.78) =$$

3.8988 mm

Since $L_{cyl} > L_{lim}$, Required Thickness of Straight Cylindrical Flange to 7.4.2

Minimum Thickness of Straight Flange Excl. Allow.

$$e_{cyl} = P * D_i / (2 * f * z - P) \quad (7.4-1)$$

1.7302 mm

Minimum Thickness of Straight Flange Incl.Corr. :

$$e_{cylA} = e_{cyl} + c = 1.73 + 0.5 =$$

2.2300 mm

7.5.3.1 Conditions of Applicability - Torispherical Ends

»Geometry Check $r=33.726 \leq 0.2 * D_i=42.8$ [mm] « » OK«

»Geometry Check $r=33.726 \geq 0.06 * D_i=12.84$ [mm] « » OK«

»Geometry Check $r=33.726 \geq 2 * e$ [mm] « » OK«

»Geometry Check $e=1.78 \leq 0.08 * D_e=17.52$ [mm] « » OK«

»Geometry Check $e_a=2.2 \geq 0.001 * D_e=0.219$ [mm] « » OK«

»Geometry Check $R=175.2 \leq D_e=219$ [mm] « » OK«

MAXIMUM ALLOWABLE WORKING PRESSURE MAWP :NEW & COLD

$$P_s = 2 * f * z * e_a / (R + 0.5 * e_a) \quad (7.5-6)$$

6.5180 MPa

$$=2 * 212.5 * 1 * 2.7 / (174.7 + 0.5 * 2.7) =$$

$$P_y = f * e_a / (\text{beta} * (0.75 * R + 0.2 * D_i)) \quad (7.5-7)$$

5.5106 MPa

$$=212.5 * 2.7 / (0.599 * (0.75 * 174.7 + 0.2 * 214)) =$$

$$P_B = 111 * f_b * (e_a / (0.75 * R + 0.2 * D_i)) ^ {1.5} * (r / D_i) ^ {0.825} \quad (7.5-8)$$

$$=111 * 236.67 * (2.7 / (0.75 * 174.7 + 0.2 * 214)) ^ {1.5} * (33.726 / 214) ^ {0.825} = \quad 11.07 \text{ MPa}$$

$$P_{cyl} = 2 * e_a * f * z / (D_i + e_a)$$

5.2953 MPa

$$P_{max} (\text{is the least of } P_s, P_y, P_b \text{ and } P_{cyl}) = P_{max}$$

$$= 5.3 =$$

5.2953 MPa

MAXIMUM ALLOWABLE WORKING PRESSURE MAWP :HOT & CORR

$$P_s = 2 * f * z * e_a / (R + 0.5 * e_a) \quad (7.5-6)$$

5.1345 MPa

$$=2 * 205.73 * 1 * 2.2 / (175.2 + 0.5 * 2.2) =$$

$$P_y = f * e_a / (\text{beta} * (0.75 * R + 0.2 * D_i)) \quad (7.5-7)$$

4.2465 MPa

$$=205.73 * 2.2 / (0.6118 * (0.75 * 175.2 + 0.2 * 214)) =$$

4.2465 MPa

Company Name -

Client :GÜVEN SOGUTMA

Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 7.5 DOMED ENDS

E3.1 Bottom Head 01 June 2023 09:03 ConnID:S1.1

$PB = 111 * fb * (ea / (0.75 * R + 0.2 * Di))^{1.5} * (r / Di)^{0.825}$ (7.5-8)
 $= 111 * 205.73 * (2.2 / (0.75 * 175.2 + 0.2 * 214))^{1.5} * (33.726 / 214)^{0.825} = 7.0578 \text{ MPa}$
 $Pcyl = 2 * ea * f * z / (Di + ea)$
 $= 2 * 2.2 * 205.73 * 1 / (214 + 2.2) = 4.1869 \text{ MPa}$
 $Pmax$ (is the least of Ps , Py , Pb and $Pcyl$) = $Pmax$
 $= 4.19 = 4.1869 \text{ MPa}$

MAX TEST PRESSURE (Uncorroded cond.at ambient temp.)

$Ps = 2 * f * z * ea / (R + 0.5 * ea)$ (7.5-6)
 $= 2 * 338.1 * 1 * 2.7 / (174.7 + 0.5 * 2.7) = 10.37 \text{ MPa}$
 $Py = f * ea / (\beta * (0.75 * R + 0.2 * Di))$ (7.5-7)
 $= 338.1 * 2.7 / (0.599 * (0.75 * 174.7 + 0.2 * 214)) = 8.7678 \text{ MPa}$
 $PB = 111 * fb * (ea / (0.75 * R + 0.2 * Di))^{1.5} * (r / Di)^{0.825}$ (7.5-8)
 $= 111 * 338.1 * (2.2 / (0.75 * 174.7 + 0.2 * 214))^{1.5} * (33.726 / 214)^{0.825} = 15.82 \text{ MPa}$
 $Pcyl = 2 * ea * f * z / (Di + ea)$
 $= 2 * 2.7 * 338.1 * 1 / (214 + 2.7) = 8.4252 \text{ MPa}$
 $Pmax$ (is the least of Ps , Py , Pb and $Pcyl$) = $Pmax$
 $= 8.43 = 8.4252 \text{ MPa}$

EN13445-5;10.2.3.3 REQUIRED MIN.HYDROSTATIC TEST PRESSURE:Ptmin

NEW AT AMBIENT TEMP. FOR TEST GROUPS 1, 2 and 3

$Ptmin = 1.25 * Pd * f_{20} / f = 1.25 * 3.3 * 212.5 / 205.73 = 4.2607 \text{ MPa}$

$Ptmin = 1.43 * Pd = 1.43 * 3.3 = 4.7190 \text{ MPa}$

Test Pressure $Ptmin=4.72 \leq Pmax=8.43$ [MPa]

56.0%

OK

Maximum diameter of Opening Not Requiring Reinforcement Check , dmax

$ris = R$ (9.5-4) = 175.2 = 175.20 mm
Length of Shell Contributing to Reinforcement
 $Is = \text{Sqr}((2 * ris + ea) * ea)$ (9.5-2)
 $= \text{Sqr}((2 * 175.2 + 2.2) * 2.2) = 27.85 \text{ mm}$
Maximum Diameter of Unreinforced Opening in Shell Checked to Rules in Section 9
 $dmax1 = \text{MIN}(0.5 * Di, (ea * Is * (f - 0.5 * P) / P - ris * Is) / (0.5 * ris + 0.5 * ea))$ (9.5-7,22,23)
 $= \text{MIN}(0.5 * 214, (2.2 * 27.85 * (205.73 - 0.5 * 3.3) / 3.3 - 175.2 * 27.85) / (0.5 * 175.2 + 0.5 * 2.2)) = 0.00 \text{ mm}$
Maximum diameter of Opening Not Requiring Reinforcement Check
 $dmax2 = 0.15 * \text{Sqr}((2 * ris + ea) * ea)$ (9.5-18)
 $= 0.15 * \text{Sqr}((2 * 175.2 + 2.2) * 2.2) = 4.1778 \text{ mm}$
Maximum Diameter of Unreinforced Opening
 $dmax = \text{MAX}(dmax1, dmax2) = \text{MAX}(0, 4.18) = 4.1778 \text{ mm}$

CALCULATION SUMMARY

7.5.3 - TORISPHERICAL ENDS UNDER INTERNAL PRESSURE

7.5.3.2 Required Minimum End Thickness

Required Minimum End Thickness Excl.Allow. $emin$:
 $emin = emin = 1.78 = 1.7758 \text{ mm}$

Required Minimum End Thickness Incl.Allow. :
 $emina = emin + c + th = 1.78 + 0.5 + 0.3 = 2.5800 \text{ mm}$

Internal Pressure $emina=2.58 \leq en=3$ [mm]

86.0%

OK

Minimum Thickness of Straight Flange Incl.Corr. :

$ecyla = ecyl + c = 1.73 + 0.5 = 2.2300 \text{ mm}$

MAXIMUM ALLOWABLE WORKING PRESSURE MAWP :NEW & COLD

$Pmax$ (is the least of Ps , Py , Pb and $Pcyl$) = $Pmax$
 $= 5.3 = 5.2953 \text{ MPa}$

Company Name -

Client :GÜVEN SOGUTMA

Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 7.5 DOMED ENDS

E3.1 Bottom Head 01 June 2023 09:03 ConnID:S1.1

MAXIMUM ALLOWABLE WORKING PRESSURE MAWP :HOT & CORRPmax (is the least of Ps, Py, Pb and Pcyl) = Pmax
=4.19=4.1869 MPa**MAX TEST PRESSURE (Uncorroded cond.at ambient temp.)**Pmax (is the least of Ps, Py, Pb and Pcyl) = Pmax
=8.43=8.4252 MPa**EN13445-5;10.2.3.3 REQUIRED MIN.HYDROSTATIC TEST PRESSURE:Ptmin**

NEW AT AMBIENT TEMP. FOR TEST GROUPS 1, 2 and 3

Ptmin = 1.25 * Pd * f20 / f =1.25*3.3*212.5/205.73=

4.2607 MPa

Ptmin = 1.43 * Pd =1.43*3.3=

4.7190 MPa**Test Pressure Ptmin=4.72 <= Pmax=8.43[MPa]****56.0%****OK****Maximum diameter of Opening Not Requiring Reinforcement Check , dmax**

Maximum Diameter of Unreinforced Opening

dmax = MAX(dmax1, dmax2) =MAX(0,4.18)=

4.1778 mm

Volume:0.0018 m3 Weight:1.5 kg (SG= 7.85)

Company Name -

Client :GÜVEN SOGUTMA

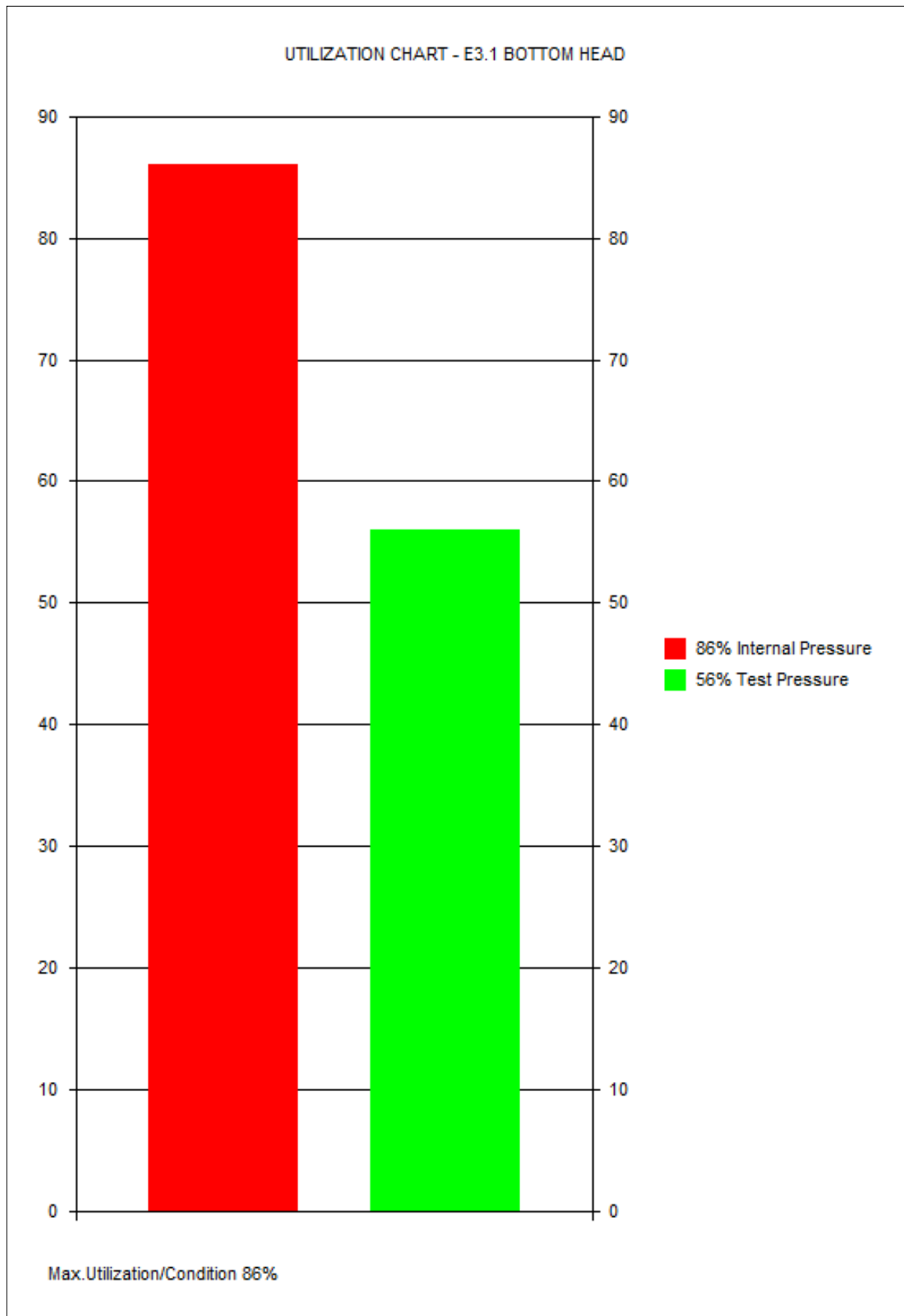
Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 7.5 DOMED ENDS

E3.1 Bottom Head

01 June 2023 09:03 ConnID:S1.1



Company Name -

Client :GÜVEN SOGUTMA

Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 9.5 ISOLATED OPENINGS IN SHELLS

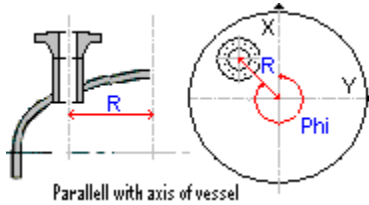
N.1 ODS 54

02 June 2023 16:51 ConnID:E3.2*

INPUT DATA

COMPONENT ATTACHMENT/LOCATION

Attachment: E3.2* Torispherical End Upper Head S1.1
Connect this nozzle to the nozzle neck of another nozzle: NO



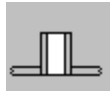
Orientation & Location of Nozzle:

Axis of Nozzle is Parallel with Axis of End (Off Center)

Angle of Rotation of nozzle axis projected in the x-y plane:Phi 0.00 Degr.

Distance between Center of End and Center of Nozzle.:R 56.00 mm

GENERAL DESIGN DATA



Type of Opening: Nozzle Without Standard ASME or DIN/EN Flange Attachment
PRESSURE LOADING: Design Component for Internal Pressure Only

PROCESS CARD:

General Design Data : Temp= 130°C, P=3.3000 MPa, c=0.5 mm, Pext=0.0000 MPa

SPECIFIC DENSITY OF OPERATING LIQUID.....:SG 0.00

LIQUID HEAD.....:LH 0.00 mm

Apply a different corrosion allowance to nozzle neck than the shell thickness.: NO

Include Nozzle Load Calculation: NO

SHELL DATA (E3.2*)

Shell Type: Torispherical End

OUTSIDE DIAMETER OF SHELL.....:De 219.00 mm

NOMINAL WALL THICKNESS (uncorroded).....:en 3.0000 mm

NEGATIVE TOLERANCE/THINNING ALLOWANCE.....:th 0.3000 mm

INSIDE SPHERICAL RADIUS (corroded).....:R 175.20 mm

EN 10028-2:2017, 1.0473 P355GH plate and strip, HT:N THK<=16mm 130'C

Rm=510 Rp=355 Rpt=308.6 fs=205.73 f20=212.5 ftest=338.1 E=203868(N/mm2) ro=7.85

NOZZLE MATERIAL DATA



Delivery Form: Seamless Pipe

EN 10216-2:2013, 1.0345 P235GH seamless tube, HT:N THK<=16mm 130'C

Rm=360 Rp=235 Rpt=191.4 fb=127.6 f20=150 ftest=223.81 E=203868(N/mm2) ro=7.85

NOZZLE DIMENSIONAL DATA

Company Name -

Client :GÜVEN SOGUTMA

Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 9.5 ISOLATED OPENINGS IN SHELLS

N.1 ODS 54

02 June 2023 16:51 ConnID:E3.2*



Attachment: Set In Flush Nozzle

Shape of Nozzle/Opening: Circular

Application:

9.4.6.3 NOT a critical fatigue area, and calc.temp.is outside creep range.

OUTSIDE NOZZLE DIAMETER.....:deb 62.00 mm

NOMINAL NOZZLE THICKNESS (uncorroded).....:enb 7.5000 mm

Size of Flange and Nozzle:

Comment (Optional):

NEGATIVE TOLERANCE/THINNING ALLOWANCE.....: 12.50 %

NOZZLE STANDOUT MEASURED FROM VESSEL OD.....:ho 40.00 mm

WELDING DATA

Nozzle/Pad to Shell Welding Area: Exclude Area of Nozzle to Shell Weld

Nozzle Weld Intersect: Nozzle Does NOT Intersect with a Welded Shell Seam

ANGLE BETWN.BRANCH AXIS AND A LINE NORMAL TO MAIN BODY:Phi 18.64 Degr.

DATA FOR REINFORCEMENT PAD



Type of Pad: No Pad

LIMITS OF REINFORCEMENT

Reduction of Limits of Reinforcement: No Reduction Required

WELDING REQUIREMENTS TO EN 1708-1:2010

Comment(Optional):

Type of welded connection: Not Applicable

CALCULATION DATA

PRELIMINARY CALCULATIONS

Shell Analysis Thickness eas

$eas = en - c - th = 3 - 0.5 - 0.3 = 2.2000$ mm

Nozzle Analysis Thickness eab

$eab = enb - cn - NegDev = 7.5 - 0.5 - 0.9375 = 6.0625$ mm

$ris = R (9.5 - 4) = 56 = 175.20$ mm

$dib = deb - 2 * eab = 62 - 2 * 6.0625 = 49.88$ mm

Min.Nozzle Thk.Based on Internal Pressure ebp

$ebp = P * deb / (2 * fb * z + P) = 3.3 * 62 / (2 * 127.6 * 1 + 3.3) = 0.7900$ mm

Allowable Stresses

$fob = Min(fs, fb) (9.5 - 8) = Min(205.73, 127.6) = 127.60$ N/mm²

GEOMETRIC LIMITATIONS

»Check Max.Diameter of Nozzle $dib/De = 0.2277 \leq 0.60 = 0.6$ [mm] (9.4.5.3)« OK«

Min.Nozzle Thk. $ebp = 0.79 \leq eab = 6.0625$ [mm]	13.0%	OK
---	-------	----

»Location in End to Fig.9.5-4 $L = 22.5 \geq De/10 = 21.9$ [mm] « » OK«

9.5.2.4.5 Nozzles oblique to the shell, with or without reinforcement pads.

Calculation of Stress Loaded Areas Effective as Reinforcement

Company Name -

Client :GÜVEN SOGUTMA Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 9.5 ISOLATED OPENINGS IN SHELLS

N.1 ODS 54 02 June 2023 16:51 ConnID:E3.2*

Area of Shell Afs

Limit of Reinforcement Along Shell Reduced by Location in Dished End
Iso = == 0.6906 mm
Set In Nozzle
Afs = eas * Is (9.5-79) =2.2*0.6906= 1.5194 mm2

Area of Nozzle Afb

Limit of Reinforcement Along Nozzle (outside shell)
Ibo = MIN(Sqr((deb - eb) * eb), ho) (9.5-76)
=MIN(Sqr((62-6.0625)*6.0625,)40)= 18.42 mm
Set In Nozzle
Afb = eb * (Ibo + Ibi + eas) (9.5-78) =6.0625*(18.42+0+2.2)= 124.98 mm2

Calculation of Pressure Loaded Areas

In the Nozzle Apb
Apb = 0.5 * dib * (Ibo + eas) (9.5-84) =0.5*49.875*(18.42+2.2)= 514.09 mm2
Additional Area due to Obliquity of Nozzle Ap(phi)
Apphi = 0.5 * dib ^ 2 * Tan(phi) (9.5-112)
=0.5*49.875^2*Tan(18.64)= 419.56 mm2
Spherical Shell/End on any Section Aps
Aps = 0.5 * ris ^ 2 * (Is + a) / (0.5 * eas + ris) (9.5-115)
=0.5*175.2^2*(0.6906+32.98)/(0.5*2.2+175.2)= 2930.71 mm2

9.5.2 Reinforcement Rules

Pressure Area Required pA(req.)

pAReq = P * (Aps + Apb + 0.5 * Apphi) (9.5-7)
=3.3*(2930.71+514.09+0.5*419.56)= 12.06 kN

Pressure Area Available pA(aval.)

pAAval = (Afs+Afw)*(fs-0.5*P)+Afp*(fop-0.5*P)+Afb*(fob-0.5*P) (9.5-7)
=(1.52+0)*(205.73-0.5*3.3)+0*(0-0.5*3.3)+124.98*(127.6-0.5*3.3)= 16.05 kN

Nozzle Reinforcement pAAval=16.05 >= pAReq=12.06[kN]	75.1%	OK
--	-------	----

Maximum Allowable Pressure Pmax

Pmax = (Afs+Afw)*fs+Afb*fob/((Aps+Apb+0.5*Apphi)+0.5*(Afs+Afw+Afb+Afp)) (9.5-10)
=(1.52+0)*205.73+124.98*127.6/((2930.71+514.09+0.5*419.56)+0.5*(1.52+0+124.98+0))= 4.3735 MPa

Max.Allowable Test Pressure Ptmax

Ptmax = == 8.3019 MPa

Weight of Nozzle: .653kg

CALCULATION SUMMARY

Min.Nozzle Thk. ebp=0.79 <= eab=6.0625[mm]	13.0%	OK
--	-------	----

9.5.2.4.5 Nozzles oblique to the shell, with or without reinforcement pads.

Limit of Reinforcement Along Shell Reduced by Location in Dished End
Iso = == 0.6906 mm
Limit of Reinforcement Along Nozzle (outside shell)
Ibo = MIN(Sqr((deb - eb) * eb), ho) (9.5-76)
=MIN(Sqr((62-6.0625)*6.0625,)40)= 18.42 mm

Company Name -

Client :GÜVEN SOGUTMA

Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 9.5 ISOLATED OPENINGS IN SHELLS

N.1 ODS 54 02 June 2023 16:51 ConnID:E3.2*

Pressure Area Required pA(req.)

$$pA_{Req} = P * (A_{ps} + A_{pb} + 0.5 * A_{pphi})$$

$$= 3.3 * (2930.71 + 514.09 + 0.5 * 419.56) =$$

$$(9.5-7)$$

$$\underline{\underline{12.06 \text{ kN}}}$$

Pressure Area Available pA(aval.)

$$pA_{Aval} = (A_{fs} + A_{fw}) * (f_s - 0.5 * P) + A_{fp} * (f_{op} - 0.5 * P) + A_{fb} * (f_{ob} - 0.5 * P)$$

$$= (1.52 + 0) * (205.73 - 0.5 * 3.3) + 0 * (0 - 0.5 * 3.3) + 124.98 * (127.6 - 0.5 * 3.3) =$$

$$(9.5-7)$$

$$\underline{\underline{16.05 \text{ kN}}}$$

Nozzle Reinforcement pAAval=16.05 >= pAReq=12.06[kN]**75.1%****OK****Maximum Allowable Pressure Pmax**

$$P_{max} = (A_{fs} + A_{fw}) * f_s + A_{fb} * f_{ob} / ((A_{ps} + A_{pb} + 0.5 * A_{pphi}) + 0.5 * (A_{fs} + A_{fw} + A_{fb} + A_{fp}))$$

$$(9.5-10)$$

$$= (1.52 + 0) * 205.73 + 124.98 * 127.6 / ((2930.71 + 514.09 + 0.5 * 419.56) + 0.5 * (1.52 + 0 + 124.98 + 0)) =$$

$$\underline{\underline{4.3735 \text{ MPa}}}$$

Volume:0.0001000 m3 Weight:0.7 kg (SG= 7.85)

Company Name -

Client :GÜVEN SOGUTMA

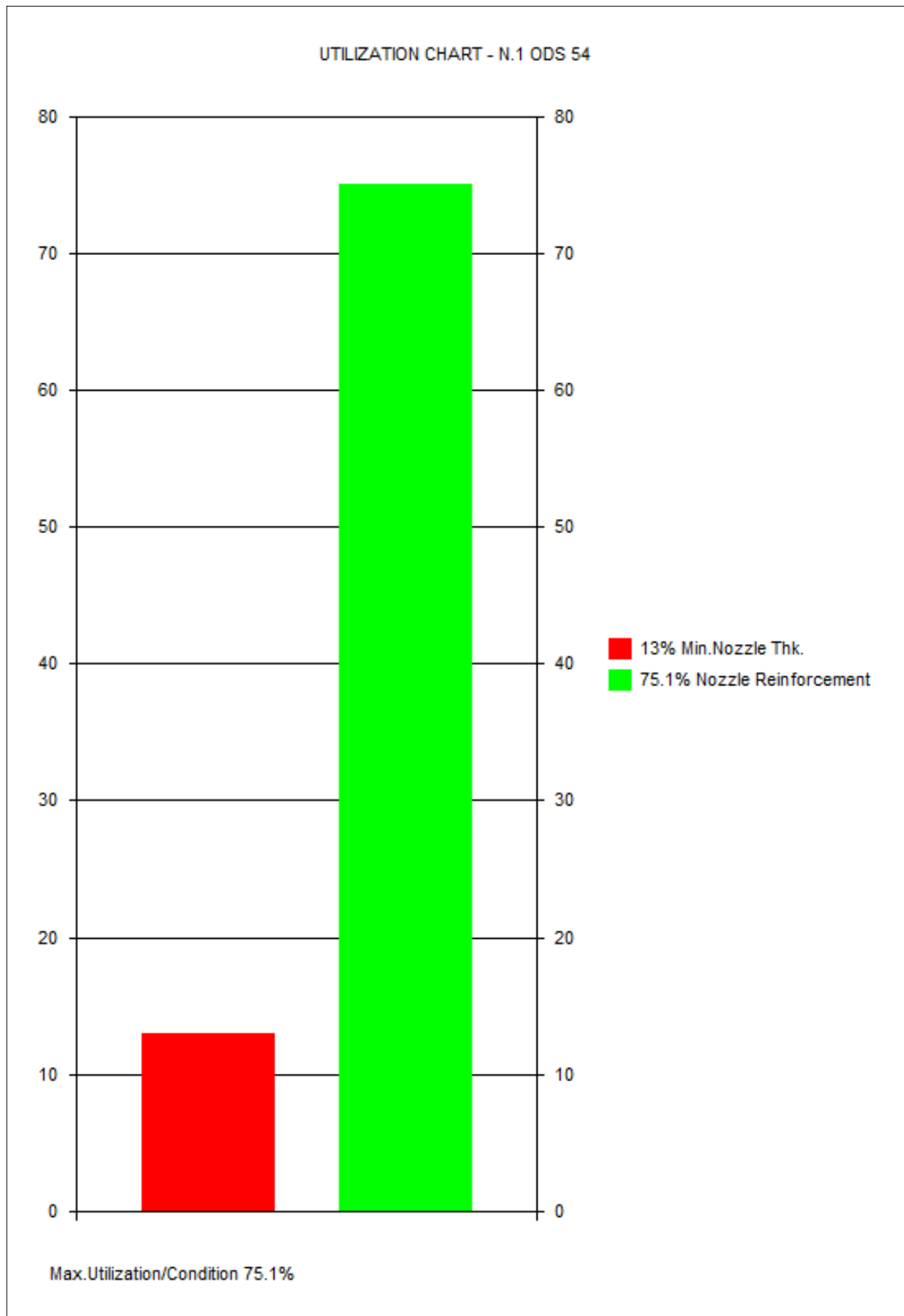
Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 9.5 ISOLATED OPENINGS IN SHELLS

N.1 ODS 54

02 June 2023 16:51 ConnID:E3.2*



Company Name -

Client :GÜVEN SOGUTMA

Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 9.5 ISOLATED OPENINGS IN SHELLS

N.3 1/2" NPT

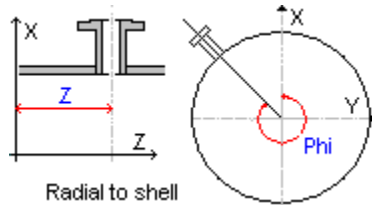
02 June 2023 17:04 ConnID:S1.1

INPUT DATA

COMPONENT ATTACHMENT/LOCATION

Attachment: S1.1 Cylindrical Shell Main Shell

Connect this nozzle to the nozzle neck of another nozzle: NO



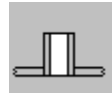
Radial to shell

Orientation & Location of Nozzle: Radial to Shell

z-location of nozzle along axis of attachment.....:z 180.00 mm

Angle of Rotation of nozzle axis projected in the x-y plane:Phi 180.00 Degr.

GENERAL DESIGN DATA



Type of Opening: Nozzle Without Standard ASME or DIN/EN Flange Attachment
PRESSURE LOADING: Design Component for Internal Pressure Only

PROCESS CARD:

General Design Data : Temp= 130°C, P=3.3000 MPa, c=0.5 mm, Pext=0.0000 MPa

SPECIFIC DENSITY OF OPERATING LIQUID.....:SG 0.00

LIQUID HEAD.....:LH 0.00 mm

Apply a different corrosion allowance to nozzle neck than the shell thickness.: NO

Include Nozzle Load Calculation: NO

SHELL DATA (S1.1)

Shell Type: Cylindrical Shell

OUTSIDE DIAMETER OF SHELL.....:De 219.00 mm

NOMINAL WALL THICKNESS (uncorroded).....:en 3.0000 mm

NEGATIVE TOLERANCE/THINNING ALLOWANCE.....:th 0.3000 mm

EN 10217-3:2019, 1.0565 P355NH welded tube, HT:N THK<=20mm 130'C

Rm=490 Rp=355 Rpt=292 fs=194.67 f20=204.17 ftest=338.1 E=203868(N/mm2) ro=7.85

NOZZLE MATERIAL DATA



Delivery Form: Seamless Pipe

EN 10216-2:2013, 1.0345 P235GH seamless tube, HT:N THK<=16mm 130'C

Rm=360 Rp=235 Rpt=191.4 fb=127.6 f20=150 ftest=223.81 E=203868(N/mm2) ro=7.85

NOZZLE DIMENSIONAL DATA

Company Name -

Client :GÜVEN SOGUTMA

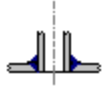
Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 9.5 ISOLATED OPENINGS IN SHELLS

N.3 1/2" NPT

02 June 2023 17:04 ConnID:S1.1



Attachment: Set In Flush Nozzle

Shape of Nozzle/Opening: Circular

Application:

9.4.6.3 NOT a critical fatigue area, and calc.temp.is outside creep range.

OUTSIDE NOZZLE DIAMETER.....:deb 31.50 mm

NOMINAL NOZZLE THICKNESS (uncorroded).....:enb 7.0500 mm

Size of Flange and Nozzle:

Comment (Optional):

NEGATIVE TOLERANCE/THINNING ALLOWANCE.....: 12.50 %

NOZZLE STANDOUT MEASURED FROM VESSEL OD.....:ho 30.00 mm

WELDING DATA

Nozzle/Pad to Shell Welding Area: Exclude Area of Nozzle to Shell Weld

Nozzle Weld Intersect: Nozzle Does NOT Intersect with a Welded Shell Seam

ANGLE PhiC(OBLIQUE IN TRANSVERSE.CROSS SECT.)Fig.9.5-2:PhiC 0.00 Degr.

ANGLE PhiL(OBLIQUE IN LONG.CROSS SECT.)Fig.9.5-1.....:PhiL 0.00 Degr.

DATA FOR REINFORCEMENT PAD



Type of Pad: No Pad

LIMITS OF REINFORCEMENT

Reduction of Limits of Reinforcement: No Reduction Required

WELDING REQUIREMENTS TO EN 1708-1:2010

Comment(Optional):

Type of welded connection: Not Applicable

CALCULATION DATA

PRELIMINARY CALCULATIONS

Shell Analysis Thickness eas 2.2000 mm

eas = en - c - th =3-0.5-0.3=

Nozzle Analysis Thickness eab 5.6688 mm

eab = enb - cn - NegDev =7.05-0.5-0.8813=

Inside Radius of Curvature ris 107.30 mm

ris = De / 2 - eas (9.5-3) =219/2-2.2=

dib = deb - 2 * eab =31.5-2*5.67= 20.16 mm

Min.Nozzle Thk.Based on Internal Pressure ebp

ebp = P * deb / (2 * fb * z + P)

=3.3*31.5/(2*127.6*1+3.3)= 0.4000 mm

Allowable Stresses

fob = Min(fs, fb) (9.5-8) =Min(194.67,127.6)= 127.60 N/mm2

GEOMETRIC LIMITATIONS

»Check Max.Diameter of Nozzle dib/(2*ris)=0.094 <= 1.00=1[mm] «» OK«

Min.Nozzle Thk. ebp=0.4 <= eab=5.67[mm]

7.0%

OK

9.5.2.4.4 Nozzles normal to the shell, with or without reinforcement pads.

Calculation of Stress Loaded Areas Effective as Reinforcement

Company Name -

Client :GÜVEN SOGUTMA Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 9.5 ISOLATED OPENINGS IN SHELLS

N.3 1/2" NPT 02 June 2023 17:04 ConnID:S1.1

Area of Shell Afs

Limit of Reinforcement Along Shell

Iso = Sqr((2 * ris + eas) * eas)

=Sqr((2*107.3+2.2)*2.2)=

21.84 mm

Set In Nozzle

Afs = eas * Is (9.5-79) =2.2*21.84=

48.05 mm2

Area of Nozzle Afb

Limit of Reinforcement Along Nozzle (outside shell)

Ibo = MIN(Sqr((deb - eb) * eb), ho)

(9.5-76)

=MIN(Sqr((31.5-5.67)*5.67),30)=

12.10 mm

Set In Nozzle

Afb = eb * (Ibo + Ibi + eas) (9.5-78) =5.67*(12.1+0+2.2)=

81.07 mm2

Calculation of Pressure Loaded Areas

In the Nozzle Apb

Apb = 0.5 * dib * (Ibo + eas) (9.5-84) =0.5*20.16*(12.1+2.2)=

144.17 mm2

Cyl.Shell in the Longitudinal Section Aps

ApsL = ris * (Is + a) (9.5-94) =107.3*(21.84+15.75)=

4033.34 mm2

Cyl.Shell in the Transverse Cross Section Aps

ApsT = 0.5 * ris ^ 2 * (Is + a) / (0.5 * eas + ris)

(9.5-105)

=0.5*107.3^2*(21.84+15.81)/(0.5*2.2+107.3)=

1999.18 mm2

Aps = MAX(ApsL ApsT) =MAX(4033.34,1999.18)=

4033.34 mm2

9.5.2 Reinforcement Rules

Pressure Area Required pA(req.)

pAReqL = P * (ApsL + Apb + 0.5 * ApphiL)

(9.5-7)

=3.3*(4033.34+144.17+0.5*0)=

13.79 kN

pAReqT = P * (ApsT + Apb + 0.5 * Apphi)

(9.5-7)

=3.3*(1999.18+144.17+0.5*0)=

7.0731 kN

pAReq = MAX(pAReqL, pAReqT) =MAX(13785.8,7073.05)=

13.79 kN

Pressure Area Available pA(aval.)

pAAval = (Afs+Afw)*(fs-0.5*P)+Afp*(fop-0.5*P)+Afb*(fob-0.5*P)

(9.5-7)

=(48.05+0)*(194.67-0.5*3.3)+0*(0-0.5*3.3)+81.07*(127.6-0.5*3.3)=

19.48 kN

Nozzle Reinforcement pAAval=19.48 >= pAReq=13.79[kN]

70.7%

OK

Maximum Allowable Pressure Pmax

Pmax = (Afs+Afw)*fs+Afb*fob/((ApsL+Apb)+0.5*(Afs+Afw+Afb+Afp))

(9.5-10)

=(48.05+0)*194.67+81.07*127.6/((4033.34+144.17)+0.5*(48.05+0+81.07+0))

= 4.6434 MPa

Max.Allowable Test Pressure Ptmax

Ptmax = ==

9.3342 MPa

Weight of Nozzle: .1453kg

CALCULATION SUMMARY

Min.Nozzle Thk. ebp=0.4 <= eab=5.67[mm]

7.0%

OK

9.5.2.4.4 Nozzles normal to the shell, with or without reinforcement pads.

Limit of Reinforcement Along Shell

Iso = Sqr((2 * ris + eas) * eas)

=Sqr((2*107.3+2.2)*2.2)=

21.84 mm

Limit of Reinforcement Along Nozzle (outside shell)

Ibo = MIN(Sqr((deb - eb) * eb), ho)

(9.5-76)

8 N.3 Nozzle,Seamless Pipe 1/2" NPT

Umax= 70.7%

Page: 18

Company Name -

Client :GÜVEN SOGUTMA

Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 9.5 ISOLATED OPENINGS IN SHELLS

N.3 1/2" NPT 02 June 2023 17:04 ConnID:S1.1

$$=\text{MIN}(\text{Sqr}((31.5-5.67)*5.67,)30)=$$

12.10 mm

Pressure Area Required pA(req.)

$$\text{pAReqL} = P * (\text{ApsL} + \text{Apb} + 0.5 * \text{ApphiL})$$

(9.5-7)

$$=3.3*(4033.34+144.17+0.5*0)=$$

13.79 kN

$$\text{pAReqT} = P * (\text{ApsT} + \text{Apb} + 0.5 * \text{Apphi})$$

(9.5-7)

$$=3.3*(1999.18+144.17+0.5*0)=$$

7.0731 kN

$$\text{pAReq} = \text{MAX}(\text{pAReqL}, \text{pAReqT}) = \text{MAX}(13785.8, 7073.05) =$$

13.79 kN

Pressure Area Available pA(aval.)

$$\text{pAAval} = (\text{Afs}+\text{Afw}) * (\text{fs}-0.5*P) + \text{Afp} * (\text{fop}-0.5*P) + \text{Afb} * (\text{fob}-0.5*P)$$

(9.5-7)

$$=(48.05+0)*(194.67-0.5*3.3)+0*(0-0.5*3.3)+81.07*(127.6-0.5*3.3)=$$

19.48 kN

Nozzle Reinforcement pAAval=19.48 >= pAReq=13.79[kN]**70.7%****OK****Maximum Allowable Pressure Pmax**

$$\text{Pmax} = (\text{Afs}+\text{Afw}) * \text{fs} + \text{Afb} * \text{fob} / ((\text{ApsL}+\text{Apb}) + 0.5 * (\text{Afs}+\text{Afw}+\text{Afb}+\text{Afp}))$$

(9.5-10)

$$=(48.05+0)*194.67+81.07*127.6 / ((4033.34+144.17)+0.5*(48.05+0+81.07+0))$$

$$= 4.6434 \text{ MPa}$$

Volume:0.00 m3 Weight:0.1 kg (SG= 7.85)

Company Name -

Client :GÜVEN SOGUTMA

Vessel Tag No.:SLA.33B.54.13.F4

Visual Vessel Design by Hexagon PPM,Ver:20.0 Operator : Rev.:A

EN13445:2014 Issue 5+A8:2019 - 9.5 ISOLATED OPENINGS IN SHELLS

N.3 1/2" NPT

02 June 2023 17:04 ConnID:S1.1

