WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

THICKNESS CALCULATION

CPH LOWER HEADER(CC3,CC7) P=2800(kPa) TEMP.=229.0(^C)

SHELL

FORMULA $$tsr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NAME	MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)	CHECK
CPH LOWER HEADER(CC3,CC7)	SA106-B	117900	1.000	0.400	0.00	168.30	149.10	10.97	1.37	9.60	1.80	O

NOZZLE

FORMULAS (1) $$tnr = \frac{PDo}{2SE + P} + 0.005Do + e$$ (ACCORDING TO PAR. PG-27.2.1)

(2) $$tnr = \frac{PDo}{2SE + 2yP} + C$$ (ACCORDING TO PAR. PG-27.2.2)

(3) $$tnr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NOZZ NO.	NAME	FORMULA	MATERIAL	S (kPa)	E	y	e or C (mm)	Do (mm)	Di (mm)	tno (mm)	Q (mm)	tn (mm)	tnr (mm)	CHECK
1	CPH LOWER HEADER NOZZLE(CC3)	(3)	SA106-B	117900	1.000	0.400	0.00	114.30	103.77	6.02	0.75	5.27	1.25	O
2	CPH TUBE(CC4)	(1)	SA178-A	92389	1.000	---	0.80	38.10	30.50	3.80	0.00	3.80	1.52	O

MAXIMUM DIAMETER OF OPENINGS WHICH

DO NOT REQUIRE COMPENSATION P=2800(kPa) TEMP.=229.0(^C)

FORMULAS

$$Drf = MAX.(D1, D2)$$

$$D1 = MIN.(203.2\,mm, 8.084 \cdot \sqrt[3]{Do \cdot ts(1-K)})$$ (ACCORDING TO PAR. PG-32.1.2)

$$K = MIN.(0.99, \frac{PDo}{182\,S \cdot ts})$$

$$D2 = MIN.(50.8\,mm, Di/4)$$ (ACCORDING TO PAR. PG-32.1.3.1)

CONDITION $Do \cdot ts = MAX.\ 387096\ mm^2$

MATERIAL	S (kPa)	Do (mm)	Di (mm)	ts (mm)	K	Do·ts (mm²)	Di / 4 (mm)	D1 (mm)	D2 (mm)	Drf (mm)
SA106-B	117900	168.30	149.10	9.60	0.229	1615	37.28	86.99	37.28	86.99

EQUIVALENT DIAMETER OF HOLES

SHELL P=2800(kPa) TEMP.=229.0(^C)

NAME	MATERIAL	Ss (kPa)	Dos (mm)	tso (mm)	Drf (mm)
CPH LOWER HEADER(CC3,CC7)	SA106-B	117900	168.30	10.97	86.99

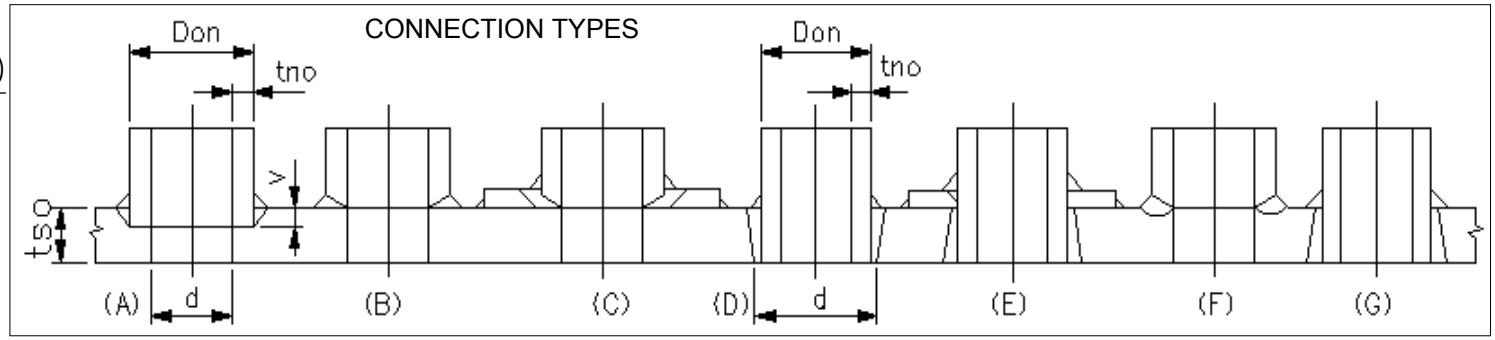
NOZZLE

$$de = \frac{ds \cdot v + d(tso - v)}{tso}$$

$$ds = Don - 2 \cdot tno \cdot K$$

$$K = MIN.(1.00, \frac{Sn}{Ss})$$

CONNECTION TYPES



VALUATIOIN

d.GT.Drf ... REINFORCEMENT

NOZZ. NO.	NAME	CONN. TYPE	MATERIAL	Sn (kPa)	Don (mm)	tno (mm)	d (mm)	v (mm)	ds (mm)	de (mm)	REINFOR. CALCUL.
1	CPH LOWER HEADER NOZZLE(CC3)	(B)	SA106-B	117900	114.30	6.02	104.00	---	---	104.00	YES
2	CPH TUBE(CC4)	(F)	SA178-A	92389	38.10	3.80	30.00	---	---	30.00	NO

CALCULATION EFFICIENCY (ACCORDING TO PAR. PG-52)

SHELL

NAME	Do (mm)	tso (mm)
CPH LOWER HEADER(CC3,CC7)	168.30	10.97

CONDITION E=MAX. 1.000

FORMULAS

(1)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$E = \frac{PL - dm}{PL}$$

(2)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

$$PC = \frac{\pi \cdot Dc \cdot \theta 1}{360}$$

$$E = \frac{2(PC - dm)}{PC}$$

(3)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

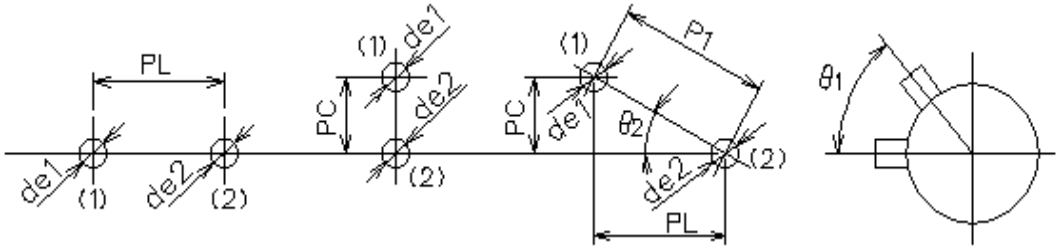
$$PC = \frac{\pi \cdot Dc \cdot \theta_1}{360}$$

$$P1 = \sqrt{PL^2 + PC^2}$$

$$\theta_2 = \tan^{-1}\left(\frac{PC}{PL}\right)$$

$$E = \frac{\sec^2\theta_2 + 1 - \left(\frac{\sec\theta_2}{P1/dm}\right)\sqrt{3 + \sec^2\theta_2}}{0.015 + 0.005 \cdot \sec^2\theta_2} / 100$$

COMB. NO.	NOZZLE HOLE (1)	NOZZLE HOLE (2)	FORM ULA	PL (mm)	PC (mm)	P1 (mm)	θ1 (DEG.)	θ2 (DEG.)	de1 (mm)	de2 (mm)	dm (mm)	E
1	2	2	(1)	96.00	---	---	---	---	30.00	30.00	30.00	0.688
2	2	2	(2)	---	85.12	---	62.00	---	30.00	30.00	30.00	1.000
3	2	2	(3)	48.00	42.56	64.15	31.00	41.56	30.00	30.00	30.00	0.593



SHELL THICKNESS BY EFFICIENCY OF LIGAMENT (ACCORDING TO PAR. PG-52 AND PG-53

SHELL P=2800(kPa) TEMP.=229.0(^C)

NAME	MATERIAL	S (kPa)	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)
CPH LOWER HEADER(CC3,CC7)	SA106-B	117900	0.400	0.00	168.30	149.10	10.97	1.37	9.60

FORMULAS

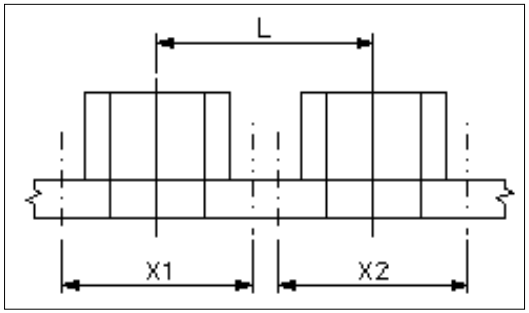
(1) $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

(2) $tsr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

VALUATION

ts.GT.tsr …THICKNESS IS SUFFICIENT
(X1+X2)/2 .GT.L …MULTI OPENING CALCULATION.

COMB. NO.	FORMULA	E	tsr (mm)	CHECK	REINFOR. CALCUL.	X1 (mm)	X2 (mm)	L (mm)	MULTI OPEN. CALCUL.
1	(2)	0.688	2.63	O	NO	---	---	---	---
2	(2)	1.000	1.80	O	NO	---	---	---	---
3	(2)	0.593	3.06	O	NO	---	---	---	---



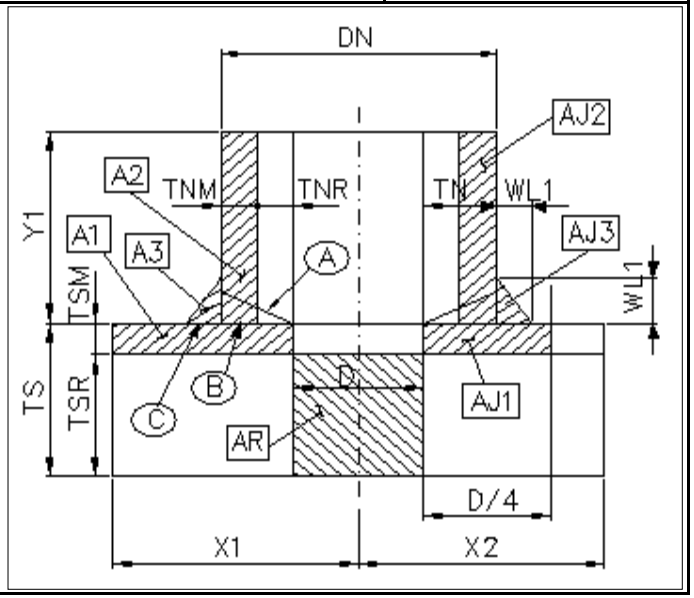
WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36) TYPE(K-4)

COMB. NO. : N/A NOZZLE NO. :1 CPH LOWER HEADER NOZZLE(CC3) P=2800(kPa) TEMP.=229.0(^C)

SHELL				NOZZLE			
MATERIAL	SA106-B	E	1.000	MATERIAL	SA106-B	E	1.000
SS(kPa)	117900	y	0.400	SN(kPa)	117900	D(mm)	104.00
DS(mm)	168.30	C(mm)	0.00	DN(mm)	114.30	WL1(mm)	7.00
Dis(mm)	149.10	F	1.000	Din(mm)	103.77		
TS(mm)	9.60			TN(mm)	5.27		
TSR(mm)	$\frac{PDis}{2 \cdot SS \cdot E - 2(1-y)P} + C$		1.80	TNR(mm)	$\frac{PDin}{2 \cdot SN \cdot E - 2(1-y)P}$		1.25
TSM(mm)	ExTS-FxTSR		7.80	TNM(mm)	TN-TNR		4.02

X1=X2 (mm)	D	MAX.
	D/2+(TS+TN)	104.00
Y1 (mm)	2.5xTS	MIN.
	2.5xTN	13.17



REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36)

COMB. NO. : N/A NOZZLE NO. :1 CPH LOWER HEADER NOZZLE(CC3)

			LARGE OPENINGS (ACCORDING TO PAR. PG-32.3.2 AND PG-32.3.3)		
AR (mm²)	D x TSR x F	187	AJR (mm²)	2/3 x AR	125
A1 (mm²)	(X1 + X2 - D) x TSM	811	AJ1 (mm²)	D/2 x TSM	406
A2 (mm²)	2 x Y1 x TNM x SN/SS	106	AJ2 (mm²)	2 x Y1 x TNM x SN/SS	106
A3 (mm²)	WL1 x WL1	49	AJ3 (mm²)	WL1 x WL1	49
A4 (mm²)	---	---	AJ4 (mm²)	---	---
A0 (mm²)	A1 + A2 + A3	966	AJ0 (mm²)	AJ1 + AJ2 + AJ3	561
VALUATION:	AO ≥ AR …REINFORCEMENT IS SUFFICIENT		VALUATION:	AJ0 ≥ AJR …REINFORCEMENT IS SUFFICIENT	

STRENGTH CALCULATIONS OF WELDS ARE NOT REQUIRED (ACCORDING TO PAR.PW-15.1.6)

P=2800(kPa) TEMP.=229.0(^C)

CALCULATION OF END PLATE

SHELL

FORMULA $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

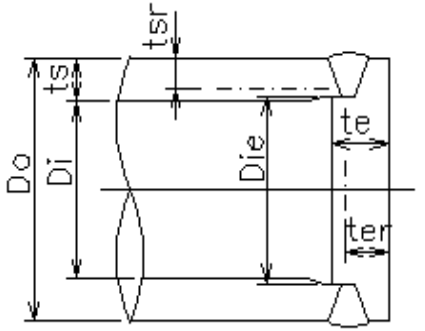
MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)
SA106-B	117900	1.000	0.400	0.00	168.30	149.10	10.97	1.37	9.60	1.98

THICKNESS CALCULATION OF END PLATE

FORMULA $ter = Die\sqrt{\frac{CP}{S}}$ (ACCORDING TO PAR. PG-31.3.2)

MATERIAL	S (kPa)	teo (mm)	Q (mm)	te (mm)	ter (mm)	-	C (0.33)	-	-	Die (mm)
SA516-70	137895	33.00	0.00	33.00	12.21	-	0.330	-	-	149.10

VALUATION:
ts.GE. 1.25xtsr…THICKNESS IS SUFFICIENT
te.GE. ter …THICKNESS IS SUFFICIENT



WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

THICKNESS CALCULATION

DEAE. INLET LOWER HEADER(ID4) P=1100(kPa) TEMP.=180.0(^C)

SHELL

FORMULA $$tsr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NAME	MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)	CHECK
DEAE. INLET LOWER HEADER(ID4)	SA106-B	117900	1.000	0.400	0.00	168.30	149.10	10.97	1.37	9.60	0.70	O

NOZZLE

FORMULAS

(1) $$tnr = \frac{PDo}{2SE + P} + 0.005Do + e$$ (ACCORDING TO PAR. PG-27.2.1)

(2) $$tnr = \frac{PDo}{2SE + 2yP} + C$$ (ACCORDING TO PAR. PG-27.2.2)

(3) $$tnr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NOZZ NO.	NAME	FORMULA	MATERIAL	S (kPa)	E	y	e or C (mm)	Do (mm)	Di (mm)	tno (mm)	Q (mm)	tn (mm)	tnr (mm)	CHECK
1	DEAE. INLET LOWER HEADER NOZZLE(ID4)	(3)	SA106-B	117900	1.000	0.400	0.00	168.30	149.10	10.97	1.37	9.60	0.70	O
2	DEAE. TUBE(ID5)	(1)	SA192	92389	1.000	---	0.00	38.10	33.30	2.40	0.00	2.40	0.38	O

MAXIMUM DIAMETER OF OPENINGS WHICH

DO NOT REQUIRE COMPENSATION P=1100(kPa) TEMP.=180.0(^C)

FORMULAS

$$Drf = MAX.(D1, D2)$$

$$D1 = MIN.(203.2\,mm, 8.084 \cdot \sqrt[3]{Do \cdot ts(1-K)})$$ (ACCORDING TO PAR. PG-32.1.2)

$$K = MIN.(0.99, \frac{PDo}{182\,S \cdot ts})$$

$$D2 = MIN.(50.8\,mm, Di/4)$$ (ACCORDING TO PAR. PG-32.1.3.1)

CONDITION $Do \cdot ts = MAX.\ 387096\ mm^2$

MATERIAL	S (kPa)	Do (mm)	Di (mm)	ts (mm)	K	Do·ts (mm²)	Di / 4 (mm)	D1 (mm)	D2 (mm)	Drf (mm)
SA106-B	117900	168.30	149.10	9.60	0.090	1615	37.28	91.92	37.28	91.92

EQUIVALENT DIAMETER OF HOLES

SHELL P=1100(kPa) TEMP.=180.0(^C)

NAME	MATERIAL	Ss (kPa)	Dos (mm)	tso (mm)	Drf (mm)
DEAE. INLET LOWER HEADER(ID4)	SA106-B	117900	168.30	10.97	91.92

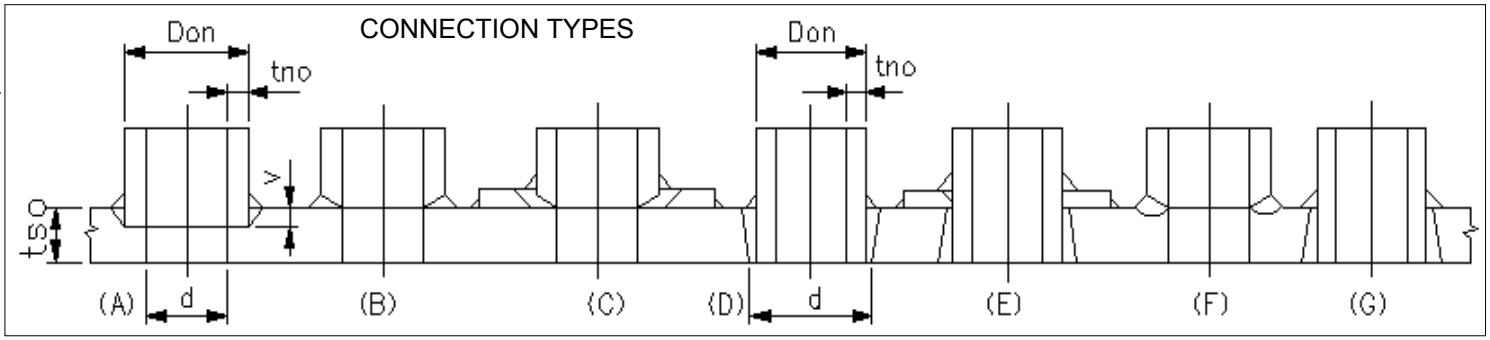
NOZZLE

$$de = \frac{ds \cdot v + d(tso - v)}{tso}$$

$$ds = Don - 2 \cdot tno \cdot K$$

$$K = MIN.(1.00, \frac{Sn}{Ss})$$

CONNECTION TYPES



VALUATIOIN

d.GT.Drf ... REINFORCEMENT

NOZZ. NO.	NAME	CONN. TYPE	MATERIAL	Sn (kPa)	Don (mm)	tno (mm)	d (mm)	v (mm)	ds (mm)	de (mm)	REINFOR. CALCUL.
1	DEAE. INLET LOWER HEADER NOZZLE(ID4)	(B)	SA106-B	117900	168.30	10.97	149.00	---	---	149.00	YES
2	DEAE. TUBE(ID5)	(F)	SA192	92389	38.10	2.40	33.00	---	---	33.00	NO

CALCULATION EFFICIENCY (ACCORDING TO PAR. PG-52)

SHELL

NAME	Do (mm)	tso (mm)
DEAE. INLET LOWER HEADER(ID4)	168.30	10.97

CONDITION E=MAX. 1.000

FORMULAS

(1)

$$dm = \frac{de1 + de2}{2}$$

$$E = \frac{PL - dm}{PL}$$

(2)

$$dm = \frac{de1 + de2}{2}$$

$$Dc = Do - tso$$

$$PC = \frac{\pi \cdot Dc \cdot \theta 1}{360}$$

$$E = \frac{2(PC - dm)}{PC}$$

(3)

$$dm = \frac{de1 + de2}{2}$$

$$Dc = Do - tso$$

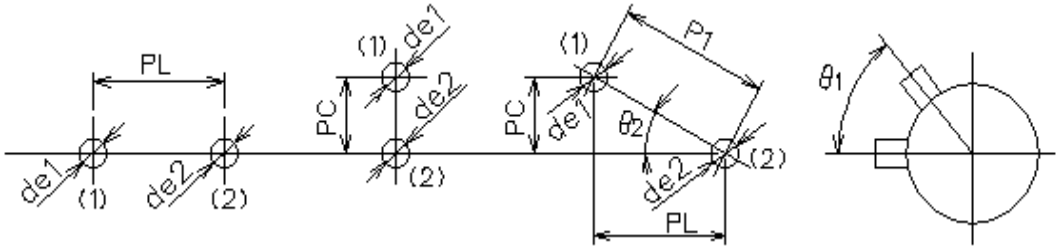
$$PC = \frac{\pi \cdot Dc \cdot \theta_1}{360}$$

$$P1 = \sqrt{PL^2 + PC^2}$$

$$\theta_2 = \tan^{-1}\left(\frac{PC}{PL}\right)$$

$$E = \frac{\sec^2\theta_2 + 1 - \left(\frac{\sec\theta_2}{P1/dm}\right)\sqrt{3 + \sec^2\theta_2}}{0.015 + 0.005 \cdot \sec^2\theta_2} / 100$$

COMB. NO.	NOZZLE HOLE (1)	NOZZLE HOLE (2)	FORM ULA	PL (mm)	PC (mm)	P1 (mm)	θ1 (DEG.)	θ2 (DEG.)	de1 (mm)	de2 (mm)	dm (mm)	E
1	2	2	(1)	96.00	---	---	---	---	33.00	33.00	33.00	0.656
2	2	2	(2)	---	85.12	---	62.00	---	33.00	33.00	33.00	1.000
3	2	2	(3)	48.00	42.56	64.15	31.00	41.56	33.00	33.00	33.00	0.536



SHELL THICKNESS BY EFFICIENCY OF LIGAMENT (ACCORDING TO PAR. PG-52 AND PG-53

SHELL P=1100(kPa) TEMP.=180.0(^C)

NAME	MATERIAL	S (kPa)	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)
DEAE. INLET LOWER HEADER(ID4)	SA106-B	117900	0.400	0.00	168.30	149.10	10.97	1.37	9.60

FORMULAS

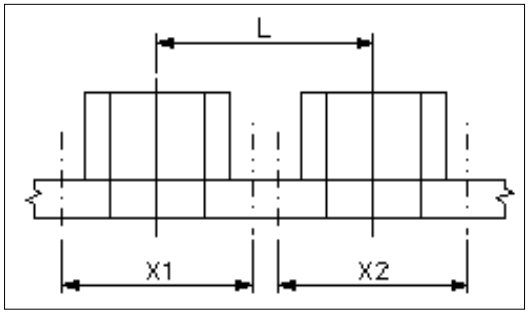
(1) $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

(2) $tsr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

VALUATION

ts.GT.tsr …THICKNESS IS SUFFICIENT
(X1+X2)/2 .GT.L …MULTI OPENING CALCULATION.

COMB. NO.	FORMULA	E	tsr (mm)	CHECK	REINFOR. CALCUL.	X1 (mm)	X2 (mm)	L (mm)	MULTI OPEN. CALCUL.
1	(2)	0.656	1.07	O	NO	---	---	---	---
2	(2)	1.000	0.70	O	NO	---	---	---	---
3	(2)	0.536	1.31	O	NO	---	---	---	---



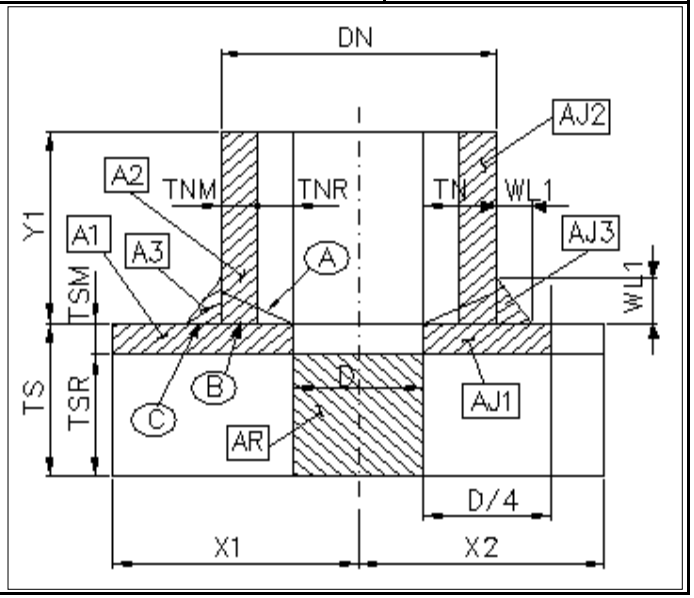
WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36) TYPE(K-4)

COMB. NO. : N/A NOZZLE NO. :1 DEAE. INLET LOWER HEADER NOZZLE(ID4) P=1100(kPa) TEMP.=180.0(^C)

SHELL				NOZZLE			
MATERIAL	SA106-B	E	1.000	MATERIAL	SA106-B	E	1.000
SS(kPa)	117900	y	0.400	SN(kPa)	117900	D(mm)	149.00
DS(mm)	168.30	C(mm)	0.00	DN(mm)	168.30	WL1(mm)	9.00
Dis(mm)	149.10	F	1.000	Din(mm)	149.10		
TS(mm)	9.60			TN(mm)	9.60		
TSR(mm)	$\frac{PDis}{2\cdot SS\cdot E-2(1-y)P}+C$		0.70	TNR(mm)	$\frac{PDin}{2\cdot SN\cdot E-2(1-y)P}$		0.70
TSM(mm)	ExTS-FxTSR		8.90	TNM(mm)	TN-TNR		8.90

X1=X2 (mm)	D	MAX.
	D/2+(TS+TN)	149.00
Y1 (mm)	2.5xTS	MIN.
	2.5xTN	24.00



REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36)

COMB. NO. : N/A NOZZLE NO. :1 DEAE. INLET LOWER HEADER NOZZLE(ID4)

			LARGE OPENINGS (ACCORDING TO PAR. PG-32.3.2 AND PG-32.3.3)		
AR (mm²)	D x TSR x F	104	AJR (mm²)	2/3 x AR	69
A1 (mm²)	(X1 + X2 - D) x TSM	1326	AJ1 (mm²)	D/2 x TSM	663
A2 (mm²)	2 x Y1 x TNM x SN/SS	427	AJ2 (mm²)	2 x Y1 x TNM x SN/SS	427
A3 (mm²)	WL1 x WL1	81	AJ3 (mm²)	WL1 x WL1	81
A4 (mm²)	---	---	AJ4 (mm²)	---	---
A0 (mm²)	A1 + A2 + A3	1834	AJ0 (mm²)	AJ1 + AJ2 + AJ3	1171
VALUATION:	AO ≥ AR …REINFORCEMENT IS SUFFICIENT		VALUATION:	AJ0 ≥ AJR …REINFORCEMENT IS SUFFICIENT	

STRENGTH CALCULATIONS OF WELDS ARE NOT REQUIRED (ACCORDING TO PAR.PW-15.1.6)

P=1100(kPa) TEMP.=180.0(^C)

CALCULATION OF END PLATE

SHELL

FORMULA $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

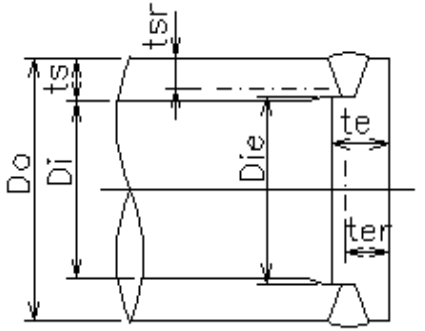
MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)
SA106-B	117900	1.000	0.400	0.00	168.30	149.10	10.97	1.37	9.60	0.78

THICKNESS CALCULATION OF END PLATE

FORMULA $ter = Die\sqrt{\frac{CP}{S}}$ (ACCORDING TO PAR. PG-31.3.2)

MATERIAL	S (kPa)	teo (mm)	Q (mm)	te (mm)	ter (mm)	-	C (0.33)	-	-	Die (mm)
SA516-70	137895	33.00	0.00	33.00	7.65	-	0.330	-	-	149.10

VALUATION:
ts.GE. 1.25xtsr…THICKNESS IS SUFFICIENT
te.GE. ter …THICKNESS IS SUFFICIENT



WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

THICKNESS CALCULATION

LP EVA. INLET LOWER HEADER(LV4) P=1400(kPa) TEMP.=192.0(^C)

SHELL

FORMULA $$tsr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NAME	MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)	CHECK
LP EVA. INLET LOWER HEADER(LV4)	SA106-B	117900	1.000	0.400	0.00	168.30	149.10	10.97	1.37	9.60	0.89	O

NOZZLE

FORMULAS (1) $$tnr = \frac{PDo}{2SE + P} + 0.005Do + e$$ (ACCORDING TO PAR. PG-27.2.1)

(2) $$tnr = \frac{PDo}{2SE + 2yP} + C$$ (ACCORDING TO PAR. PG-27.2.2)

(3) $$tnr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NOZZ NO.	NAME	FORMULA	MATERIAL	S (kPa)	E	y	e or C (mm)	Do (mm)	Di (mm)	tno (mm)	Q (mm)	tn (mm)	tnr (mm)	CHECK
1	LP EVA. INLET LOWER HEADER NOZZLE(LV4)	(3)	SA106-B	117900	1.000	0.400	0.00	141.30	129.84	6.55	0.82	5.73	0.78	O
2	LP EVA. TUBE(LV5)	(1)	SA192	92389	1.000	---	0.00	38.10	33.30	2.40	0.00	2.40	0.44	O

MAXIMUM DIAMETER OF OPENINGS WHICH

DO NOT REQUIRE COMPENSATION P=1400(kPa) TEMP.=192.0(^C)

FORMULAS

$$Drf = MAX.(D1, D2)$$

$$D1 = MIN.(203.2\,mm, 8.084 \cdot \sqrt[3]{Do \cdot ts(1-K)})$$ (ACCORDING TO PAR. PG-32.1.2)

$$K = MIN.(0.99, \frac{PDo}{182\,S \cdot ts})$$

$$D2 = MIN.(50.8\,mm, Di/4)$$ (ACCORDING TO PAR. PG-32.1.3.1)

CONDITION $Do \cdot ts = MAX.\ 387096\ mm^2$

MATERIAL	S (kPa)	Do (mm)	Di (mm)	ts (mm)	K	Do·ts (mm²)	Di / 4 (mm)	D1 (mm)	D2 (mm)	Drf (mm)
SA106-B	117900	168.30	149.10	9.60	0.114	1615	37.28	91.09	37.28	91.09

EQUIVALENT DIAMETER OF HOLES

SHELL P=1400(kPa) TEMP.=192.0(^C)

NAME	MATERIAL	Ss (kPa)	Dos (mm)	tso (mm)	Drf (mm)
LP EVA. INLET LOWER HEADER(LV4)	SA106-B	117900	168.30	10.97	91.09

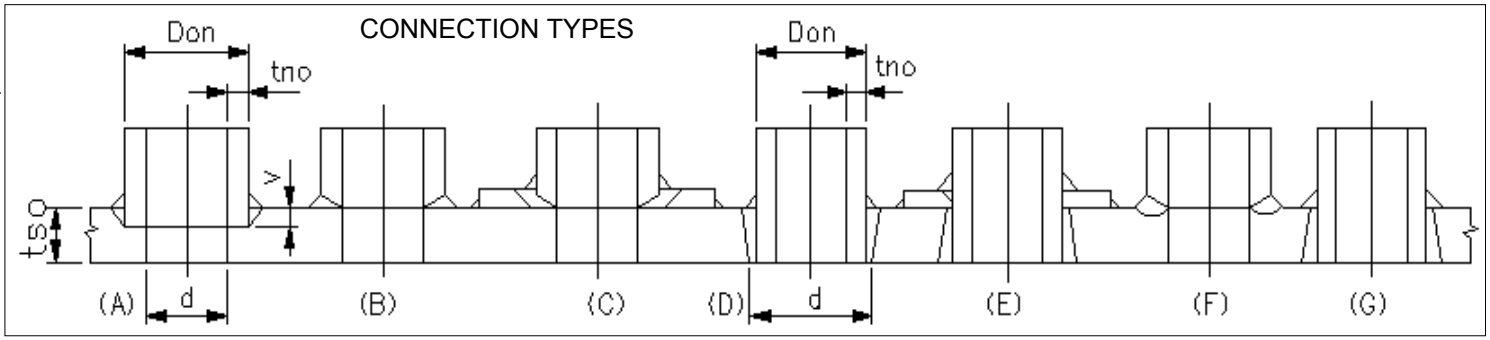
NOZZLE

$$de = \frac{ds \cdot v + d(tso - v)}{tso}$$

$$ds = Don - 2 \cdot tno \cdot K$$

$$K = MIN.(1.00, \frac{Sn}{Ss})$$

CONNECTION TYPES



VALUATIOIN

d.GT.Drf ... REINFORCEMENT

NOZZ. NO.	NAME	CONN. TYPE	MATERIAL	Sn (kPa)	Don (mm)	tno (mm)	d (mm)	v (mm)	ds (mm)	de (mm)	REINFOR. CALCUL.
1	LP EVA. INLET LOWER HEADER NOZZLE(LV4)	(B)	SA106-B	117900	141.30	6.55	130.00	---	---	130.00	YES
2	LP EVA. TUBE(LV5)	(F)	SA192	92389	38.10	2.40	33.00	---	---	33.00	NO

WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

CALCULATION EFFICIENCY (ACCORDING TO PAR. PG-52)

SHELL

NAME	Do (mm)	tso (mm)
LP EVA. INLET LOWER HEADER(LV4)	168.30	10.97

CONDITION E=MAX. 1.000

FORMULAS

(1)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$E = \frac{PL - dm}{PL}$$

(2)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

$$PC = \frac{\pi \cdot Dc \cdot \theta 1}{360}$$

$$E = \frac{2(PC - dm)}{PC}$$

(3)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

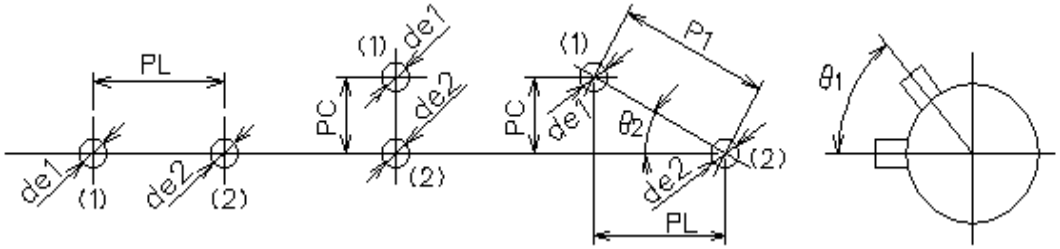
$$PC = \frac{\pi \cdot Dc \cdot \theta_1}{360}$$

$$P1 = \sqrt{PL^2 + PC^2}$$

$$\theta_2 = \tan^{-1}\left(\frac{PC}{PL}\right)$$

$$E = \frac{\sec^2\theta_2 + 1 - \left(\frac{\sec\theta_2}{P1/dm}\right)\sqrt{3 + \sec^2\theta_2}}{0.015 + 0.005 \cdot \sec^2\theta_2} / 100$$

COMB. NO.	NOZZLE HOLE (1)	NOZZLE HOLE (2)	FORM ULA	PL (mm)	PC (mm)	P1 (mm)	θ1 (DEG.)	θ2 (DEG.)	de1 (mm)	de2 (mm)	dm (mm)	E
1	2	2	(1)	96.00	---	---	---	---	33.00	33.00	33.00	0.656
2	2	2	(2)	---	85.12	---	62.00	---	33.00	33.00	33.00	1.000
3	2	2	(3)	48.00	42.56	64.15	31.00	41.56	33.00	33.00	33.00	0.536



SHELL THICKNESS BY EFFICIENCY OF LIGAMENT (ACCORDING TO PAR. PG-52 AND PG-53

SHELL P=1400(kPa) TEMP.=192.0(^C)

NAME	MATERIAL	S (kPa)	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)
LP EVA. INLET LOWER HEADER(LV4)	SA106-B	117900	0.400	0.00	168.30	149.10	10.97	1.37	9.60

FORMULAS

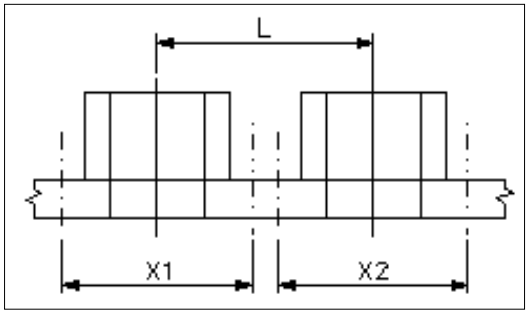
(1) $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

(2) $tsr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

VALUATION

ts.GT.tsr …THICKNESS IS SUFFICIENT
(X1+X2)/2 .GT.L …MULTI OPENING CALCULATION.

COMB. NO.	FORM ULA	E	tsr (mm)	CHECK	REINFOR. CALCUL.	X1 (mm)	X2 (mm)	L (mm)	MULTI OPEN. CALCUL.
1	(2)	0.656	1.36	O	NO	---	---	---	---
2	(2)	1.000	0.89	O	NO	---	---	---	---
3	(2)	0.536	1.67	O	NO	---	---	---	---



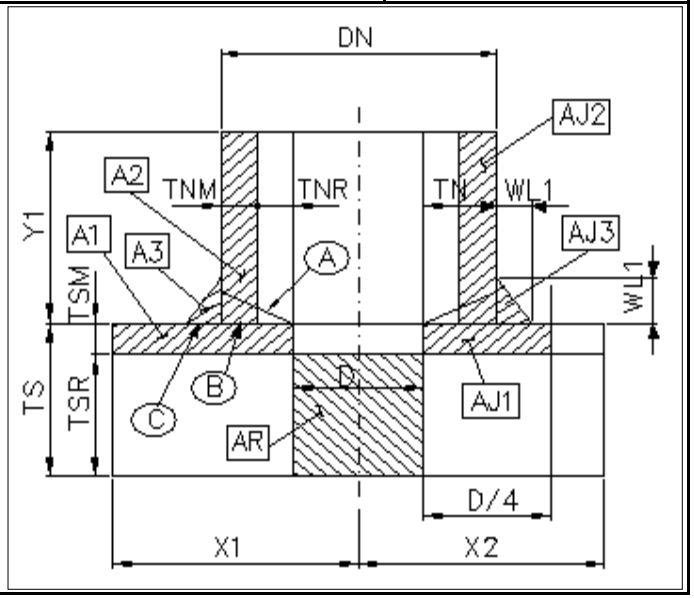
WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36) TYPE(K-4)

COMB. NO. : N/A NOZZLE NO. :1 LP EVA. INLET LOWER HEADER NOZZLE(LV4) P=1400(kPa) TEMP.=192.0(^C)

SHELL				NOZZLE			
MATERIAL	SA106-B	E	1.000	MATERIAL	SA106-B	E	1.000
SS(kPa)	117900	y	0.400	SN(kPa)	117900	D(mm)	130.00
DS(mm)	168.30	C(mm)	0.00	DN(mm)	141.30	WL1(mm)	7.00
Dis(mm)	149.10	F	1.000	Din(mm)	129.84		
TS(mm)	9.60			TN(mm)	5.73		
TSR(mm)	$\frac{PDis}{2 \cdot SS \cdot E - 2(1-y)P} + C$		0.89	TNR(mm)	$\frac{PDin}{2 \cdot SN \cdot E - 2(1-y)P}$		0.78
TSM(mm)	ExTS-FxTSR		8.71	TNM(mm)	TN-TNR		4.95

X1=X2 (mm)	D	MAX.
	D/2+(TS+TN)	130.00
Y1 (mm)	2.5xTS	MIN.
	2.5xTN	14.33



REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36)

COMB. NO. : N/A NOZZLE NO. :1 LP EVA. INLET LOWER HEADER NOZZLE(LV4)

			LARGE OPENINGS (ACCORDING TO PAR. PG-32.3.2 AND PG-32.3.3)		
AR (mm²)	D x TSR x F	116	AJR (mm²)	2/3 x AR	77
A1 (mm²)	(X1 + X2 - D) x TSM	1132	AJ1 (mm²)	D/2 x TSM	566
A2 (mm²)	2 x Y1 x TNM x SN/SS	142	AJ2 (mm²)	2 x Y1 x TNM x SN/SS	142
A3 (mm²)	WL1 x WL1	49	AJ3 (mm²)	WL1 x WL1	49
A4 (mm²)	---	---	AJ4 (mm²)	---	---
A0 (mm²)	A1 + A2 + A3	1323	AJ0 (mm²)	AJ1 + AJ2 + AJ3	757
VALUATION:	AO ≥ AR …REINFORCEMENT IS SUFFICIENT		VALUATION:	AJ0 ≥ AJR …REINFORCEMENT IS SUFFICIENT	

STRENGTH CALCULATIONS OF WELDS ARE NOT REQUIRED (ACCORDING TO PAR.PW-15.1.6)

P=1400(kPa) TEMP.=192.0(^C)

CALCULATION OF END PLATE

SHELL

FORMULA $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

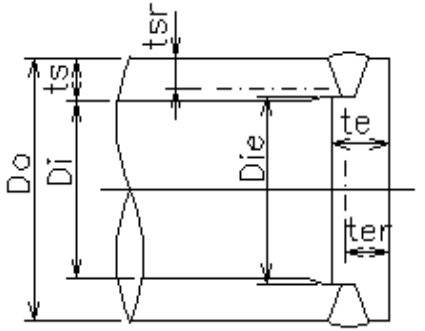
MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)
SA106-B	117900	1.000	0.400	0.00	168.30	149.10	10.97	1.37	9.60	0.99

THICKNESS CALCULATION OF END PLATE

FORMULA $ter = Die\sqrt{\frac{CP}{S}}$ (ACCORDING TO PAR. PG-31.3.2)

MATERIAL	S (kPa)	teo (mm)	Q (mm)	te (mm)	ter (mm)	-	C (0.33)	-	-	Die (mm)
SA516-70	137895	33.00	0.00	33.00	8.63	-	0.330	-	-	149.10

VALUATION:
ts.GE. 1.25xtsr…THICKNESS IS SUFFICIENT
te.GE. ter …THICKNESS IS SUFFICIENT



WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

THICKNESS CALCULATION

LP SH INLET UPPER HEADER(LS2) P=1200(kPa) TEMP.=192.0(^C)

SHELL

FORMULA $$tsr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NAME	MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)	CHECK
LP SH INLET UPPER HEADER(LS2)	SA106-B	117900	1.000	0.400	0.00	219.10	196.88	12.70	1.59	11.11	1.01	O

NOZZLE

FORMULAS

(1) $$tnr = \frac{PDo}{2SE + P} + 0.005Do + e$$ (ACCORDING TO PAR. PG-27.2.1)

(2) $$tnr = \frac{PDo}{2SE + 2yP} + C$$ (ACCORDING TO PAR. PG-27.2.2)

(3) $$tnr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NOZZ NO.	NAME	FORMULA	MATERIAL	S (kPa)	E	y	e or C (mm)	Do (mm)	Di (mm)	tno (mm)	Q (mm)	tn (mm)	tnr (mm)	CHECK
1	LP SH INLET UPPER HEADER NOZZLE(LS2)	(3)	SA106-B	117900	1.000	0.400	0.00	219.10	196.88	12.70	1.59	11.11	1.01	O
2	LP SH TUBE(LS3)	(1)	SA192	92389	1.000	---	0.00	38.10	33.30	2.40	0.00	2.40	0.44	O

MAXIMUM DIAMETER OF OPENINGS WHICH

DO NOT REQUIRE COMPENSATION P=1200(kPa) TEMP.=192.0(^C)

FORMULAS

$$Drf = MAX.(D1, D2)$$

$$D1 = MIN.(203.2\,mm, 8.084 \cdot \sqrt[3]{Do \cdot ts(1-K)})$$ (ACCORDING TO PAR. PG-32.1.2)

$$K = MIN.(0.99, \frac{PDo}{182\,S \cdot ts})$$

$$D2 = MIN.(50.8\,mm, Di/4)$$ (ACCORDING TO PAR. PG-32.1.3.1)

CONDITION $Do \cdot ts = MAX.\ 387096\ mm^2$

MATERIAL	S (kPa)	Do (mm)	Di (mm)	ts (mm)	K	Do·ts (mm²)	Di / 4 (mm)	D1 (mm)	D2 (mm)	Drf (mm)
SA106-B	117900	219.10	196.88	11.11	0.110	2435	49.22	104.60	49.22	104.60

EQUIVALENT DIAMETER OF HOLES

SHELL P=1200(kPa) TEMP.=192.0(^C)

NAME	MATERIAL	Ss (kPa)	Dos (mm)	tso (mm)	Drf (mm)
LP SH INLET UPPER HEADER(LS2)	SA106-B	117900	219.10	12.70	104.60

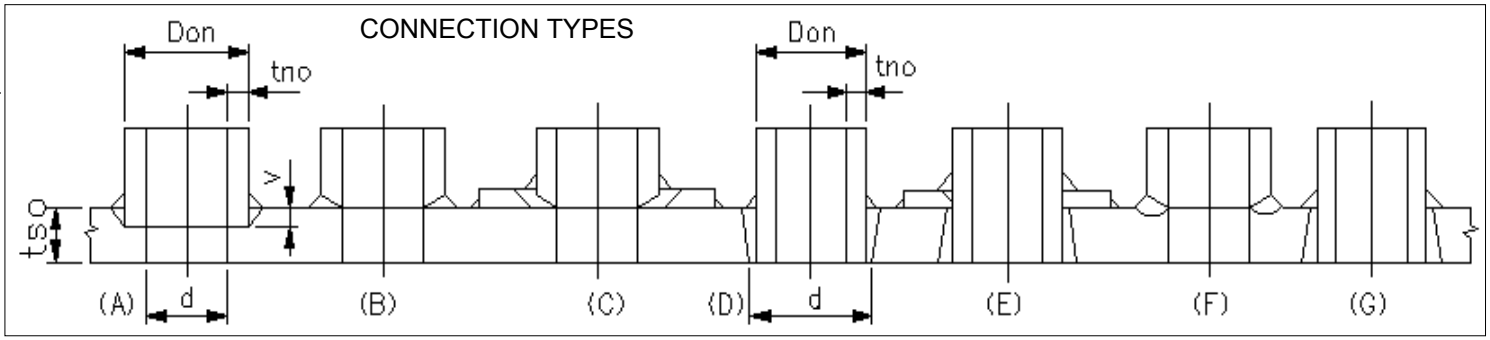
NOZZLE

$$de = \frac{ds \cdot v + d(tso - v)}{tso}$$

$$ds = Don - 2 \cdot tno \cdot K$$

$$K = MIN.(1.00, \frac{Sn}{Ss})$$

CONNECTION TYPES



VALUATIOIN

d.GT.Drf ... REINFORCEMENT

NOZZ. NO.	NAME	CONN. TYPE	MATERIAL	Sn (kPa)	Don (mm)	tno (mm)	d (mm)	v (mm)	ds (mm)	de (mm)	REINFOR. CALCUL.
1	LP SH INLET UPPER HEADER NOZZLE(LS2)	(B)	SA106-B	117900	219.10	12.70	197.00	---	---	197.00	YES
2	LP SH TUBE(LS3)	(F)	SA192	92389	38.10	2.40	33.00	---	---	33.00	NO

WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

CALCULATION EFFICIENCY (ACCORDING TO PAR. PG-52)

SHELL

NAME	Do (mm)	tso (mm)
LP SH INLET UPPER HEADER(LS2)	219.10	12.70

CONDITION E=MAX. 1.000

FORMULAS

(1)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$E = \frac{PL - dm}{PL}$$

(2)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

$$PC = \frac{\pi \cdot Dc \cdot \theta 1}{360}$$

$$E = \frac{2(PC - dm)}{PC}$$

(3)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

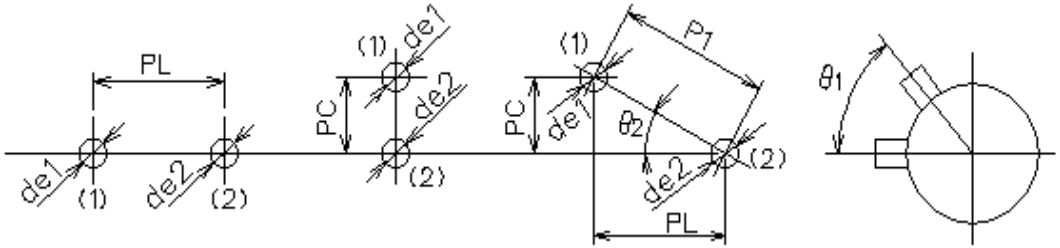
$$PC = \frac{\pi \cdot Dc \cdot \theta_1}{360}$$

$$P1 = \sqrt{PL^2 + PC^2}$$

$$\theta_2 = \tan^{-1}\left(\frac{PC}{PL}\right)$$

$$E = \frac{\sec^2\theta_2 + 1 - \left(\frac{\sec\theta_2}{P1/dm}\right)\sqrt{3 + \sec^2\theta_2}}{0.015 + 0.005 \cdot \sec^2\theta_2} / 100$$

COMB. NO.	NOZZLE HOLE (1)	NOZZLE HOLE (2)	FORM ULA	PL (mm)	PC (mm)	P1 (mm)	θ1 (DEG.)	θ2 (DEG.)	de1 (mm)	de2 (mm)	dm (mm)	E
1	2	2	(1)	96.00	---	---	---	---	33.00	33.00	33.00	0.656



SHELL THICKNESS BY EFFICIENCY OF LIGAMENT (ACCORDING TO PAR. PG-52 AND PG-53

SHELL P=1200(kPa) TEMP.=192.0(^C)

NAME	MATERIAL	S (kPa)	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)
LP SH INLET UPPER HEADER(LS2)	SA106-B	117900	0.400	0.00	219.10	196.88	12.70	1.59	11.11

FORMULAS

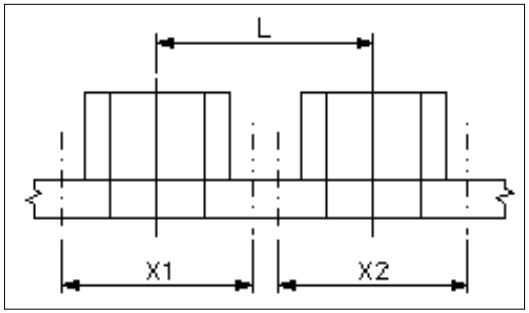
(1) $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

(2) $tsr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

VALUATION

ts.GT.tsr …THICKNESS IS SUFFICIENT
(X1+X2)/2 .GT.L …MULTI OPENING CALCULATION.

COMB. NO.	FORMULA	E	tsr (mm)	CHECK	REINFOR. CALCUL.	X1 (mm)	X2 (mm)	L (mm)	MULTI OPEN. CALCUL.
1	(2)	0.656	1.54	O	NO	---	---	---	---



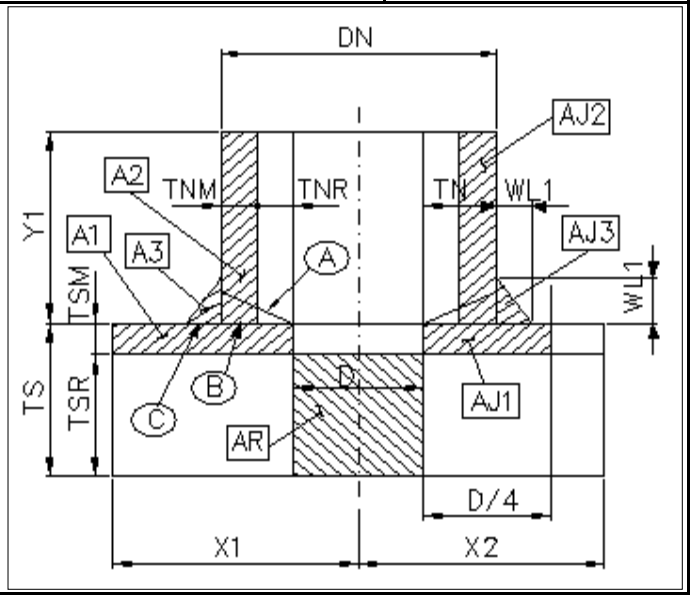
WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36) TYPE(K-4)

COMB. NO. : N/A NOZZLE NO. :1 LP SH INLET UPPER HEADER NOZZLE(LS2) P=1200(kPa) TEMP.=192.0(^C)

SHELL				NOZZLE			
MATERIAL	SA106-B	E	1.000	MATERIAL	SA106-B	E	1.000
SS(kPa)	117900	y	0.400	SN(kPa)	117900	D(mm)	197.00
DS(mm)	219.10	C(mm)	0.00	DN(mm)	219.10	WL1(mm)	9.00
Dis(mm)	196.88	F	1.000	Din(mm)	196.88		
TS(mm)	11.11			TN(mm)	11.11		
TSR(mm)	$\frac{PDis}{2 \cdot SS \cdot E - 2(1-y)P} + C$		1.01	TNR(mm)	$\frac{PDin}{2 \cdot SN \cdot E - 2(1-y)P}$		1.01
TSM(mm)	ExTS-FxTSR		10.10	TNM(mm)	TN-TNR		10.10

X1=X2 (mm)	D	MAX.
	D/2+(TS+TN)	197.00
Y1 (mm)	2.5xTS	MIN.
	2.5xTN	27.78



REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36)

COMB. NO. : N/A NOZZLE NO. :1 LP SH INLET UPPER HEADER NOZZLE(LS2)

			LARGE OPENINGS (ACCORDING TO PAR. PG-32.3.2 AND PG-32.3.3)		
AR (mm²)	D x TSR x F	199	AJR (mm²)	2/3 x AR	132
A1 (mm²)	(X1 + X2 - D) x TSM	1991	AJ1 (mm²)	D/2 x TSM	995
A2 (mm²)	2 x Y1 x TNM x SN/SS	561	AJ2 (mm²)	2 x Y1 x TNM x SN/SS	561
A3 (mm²)	WL1 x WL1	81	AJ3 (mm²)	WL1 x WL1	81
A4 (mm²)	---	---	AJ4 (mm²)	---	---
A0 (mm²)	A1 + A2 + A3	2633	AJ0 (mm²)	AJ1 + AJ2 + AJ3	1638
VALUATION:	AO ≥ AR …REINFORCEMENT IS SUFFICIENT		VALUATION:	AJ0 ≥ AJR …REINFORCEMENT IS SUFFICIENT	

STRENGTH CALCULATIONS OF WELDS ARE NOT REQUIRED (ACCORDING TO PAR.PW-15.1.6)

P=1200(kPa) TEMP.=192.0(^C)

CALCULATION OF END PLATE

SHELL

FORMULA $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

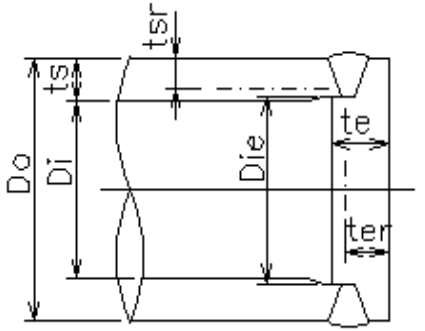
MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)
SA106-B	117900	1.000	0.400	0.00	219.10	196.88	12.70	1.59	11.11	1.11

THICKNESS CALCULATION OF END PLATE

FORMULA $ter = Die\sqrt{\frac{CP}{S}}$ (ACCORDING TO PAR. PG-31.3.2)

MATERIAL	S (kPa)	teo (mm)	Q (mm)	te (mm)	ter (mm)	-	C (0.33)	-	-	Die (mm)
SA516-70	137895	33.00	0.00	33.00	10.55	-	0.330	-	-	196.88

VALUATION:
ts.GE. 1.25xtsr…THICKNESS IS SUFFICIENT
te.GE. ter …THICKNESS IS SUFFICIENT



WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

THICKNESS CALCULATION

HP 1st ECO. OUTLET UPPER HEADER(1HC5) P=15100(kPa) TEMP.=344.0(^C)

SHELL

FORMULA $$tsr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NAME	MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)	CHECK
HP 1st ECO. OUTLET UPPER HEADER(1HC5)	SA106-C	136268	1.000	0.400	0.00	168.30	129.89	21.95	2.74	19.21	7.71	O

NOZZLE

FORMULAS (1) $$tnr = \frac{PDo}{2SE + P} + 0.005Do + e$$ (ACCORDING TO PAR. PG-27.2.1)

(2) $$tnr = \frac{PDo}{2SE + 2yP} + C$$ (ACCORDING TO PAR. PG-27.2.2)

(3) $$tnr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NOZZ NO.	NAME	FORMULA	MATERIAL	S (kPa)	E	y	e or C (mm)	Do (mm)	Di (mm)	tno (mm)	Q (mm)	tn (mm)	tnr (mm)	CHECK
1	HP 1st ECO. TUBE(1HC4)	(1)	SA178-C	117652	1.000	---	0.80	38.10	30.70	3.70	0.00	3.70	3.29	O
2	HP 1st ECO. OUTLET UPPER HEADER NOZZLE(1HC5)	(3)	SA106-C	136268	1.000	0.400	0.00	141.30	119.08	12.70	1.59	11.11	7.07	O

MAXIMUM DIAMETER OF OPENINGS WHICH

DO NOT REQUIRE COMPENSATION P=15100(kPa) TEMP.=344.0(^C)

FORMULAS

$$Drf = MAX.(D1, D2)$$

$$D1 = MIN.(203.2\,mm, 8.084 \cdot \sqrt[3]{Do \cdot ts(1-K)})$$ (ACCORDING TO PAR. PG-32.1.2)

$$K = MIN.(0.99, \frac{PDo}{182\,S \cdot ts})$$

$$D2 = MIN.(50.8\,mm, Di/4)$$ (ACCORDING TO PAR. PG-32.1.3.1)

CONDITION $Do \cdot ts = MAX.\ 387096\ mm^2$

MATERIAL	S (kPa)	Do (mm)	Di (mm)	ts (mm)	K	Do·ts (mm²)	Di / 4 (mm)	D1 (mm)	D2 (mm)	Drf (mm)
SA106-C	136268	168.30	129.89	19.21	0.534	3232	32.47	92.70	32.47	92.70

EQUIVALENT DIAMETER OF HOLES

SHELL P=15100(kPa) TEMP.=344.0(^C)

NAME	MATERIAL	Ss (kPa)	Dos (mm)	tso (mm)	Drf (mm)
HP 1st ECO. OUTLET UPPER HEADER(1HC5)	SA106-C	136268	168.30	21.95	92.70

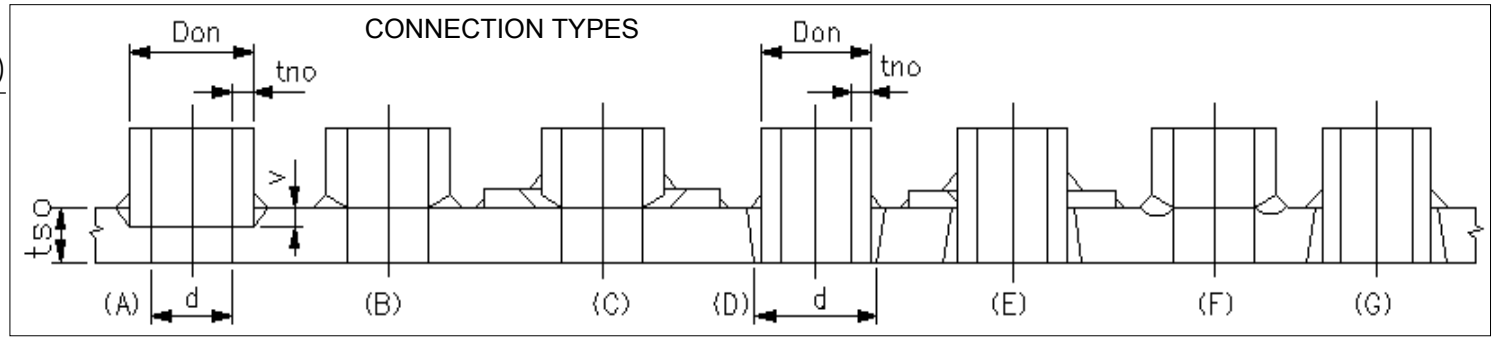
NOZZLE

$$de = \frac{ds \cdot v + d(tso - v)}{tso}$$

$$ds = Don - 2 \cdot tno \cdot K$$

$$K = MIN.(1.00, \frac{Sn}{Ss})$$

CONNECTION TYPES



VALUATIOIN

d.GT.Drf ... REINFORCEMENT

NOZZ. NO.	NAME	CONN. TYPE	MATERIAL	Sn (kPa)	Don (mm)	tno (mm)	d (mm)	v (mm)	ds (mm)	de (mm)	REINFOR. CALCUL.
1	HP 1st ECO. TUBE(1HC4)	(F)	SA178-C	117652	38.10	3.70	30.50	---	---	30.50	NO
2	HP 1st ECO. OUTLET UPPER HEADER NOZZLE(1HC5)	(B)	SA106-C	136268	141.30	12.70	119.00	---	---	119.00	YES

WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

CALCULATION EFFICIENCY (ACCORDING TO PAR. PG-52)

SHELL

NAME	Do (mm)	tso (mm)
HP 1st ECO. OUTLET UPPER HEADER(1HC5)	168.30	21.95

CONDITION E=MAX. 1.000

FORMULAS

(1)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$E = \frac{PL - dm}{PL}$$

(2)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

$$PC = \frac{\pi \cdot Dc \cdot \theta 1}{360}$$

$$E = \frac{2(PC - dm)}{PC}$$

(3)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

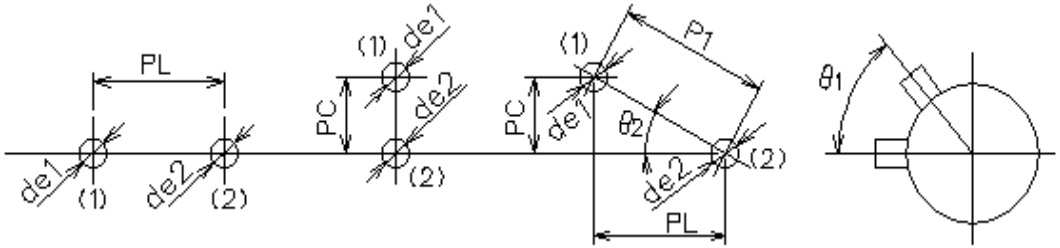
$$PC = \frac{\pi \cdot Dc \cdot \theta_1}{360}$$

$$P1 = \sqrt{PL^2 + PC^2}$$

$$\theta_2 = \tan^{-1}\left(\frac{PC}{PL}\right)$$

$$E = \frac{\sec^2\theta_2 + 1 - \left(\frac{\sec\theta_2}{P1/dm}\right)\sqrt{3 + \sec^2\theta_2}}{0.015 + 0.005 \cdot \sec^2\theta_2} / 100$$

COMB. NO.	NOZZLE HOLE (1)	NOZZLE HOLE (2)	FORM ULA	PL (mm)	PC (mm)	P1 (mm)	θ1 (DEG.)	θ2 (DEG.)	de1 (mm)	de2 (mm)	dm (mm)	E
1	1	1	(1)	96.00	---	---	---	---	30.50	30.50	30.50	0.682
2	1	1	(2)	---	79.18	---	62.00	---	30.50	30.50	30.50	1.000
3	1	1	(3)	48.00	39.59	62.22	31.00	39.52	30.50	30.50	30.50	0.558



SHELL THICKNESS BY EFFICIENCY OF LIGAMENT (ACCORDING TO PAR. PG-52 AND PG-53

SHELL P=15100(kPa) TEMP.=344.0(^C)

NAME	MATERIAL	S (kPa)	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)
HP 1st ECO. OUTLET UPPER HEADER(1HC5)	SA106-C	136268	0.400	0.00	168.30	129.89	21.95	2.74	19.21

FORMULAS

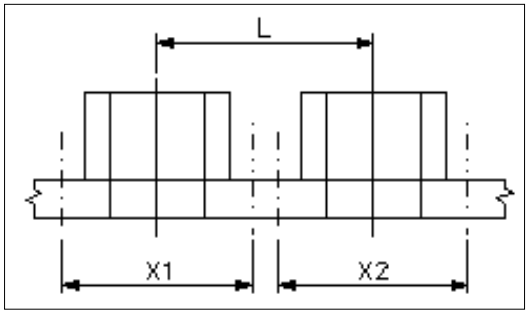
(1) $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

(2) $tsr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

VALUATION

ts.GT.tsr …THICKNESS IS SUFFICIENT
(X1+X2)/2 .GT.L …MULTI OPENING CALCULATION.

COMB. NO.	FORMULA	E	tsr (mm)	CHECK	REINFOR. CALCUL.	X1 (mm)	X2 (mm)	L (mm)	MULTI OPEN. CALCUL.
1	(2)	0.682	11.69	O	NO	---	---	---	---
2	(2)	1.000	7.71	O	NO	---	---	---	---
3	(2)	0.558	14.64	O	NO	---	---	---	---



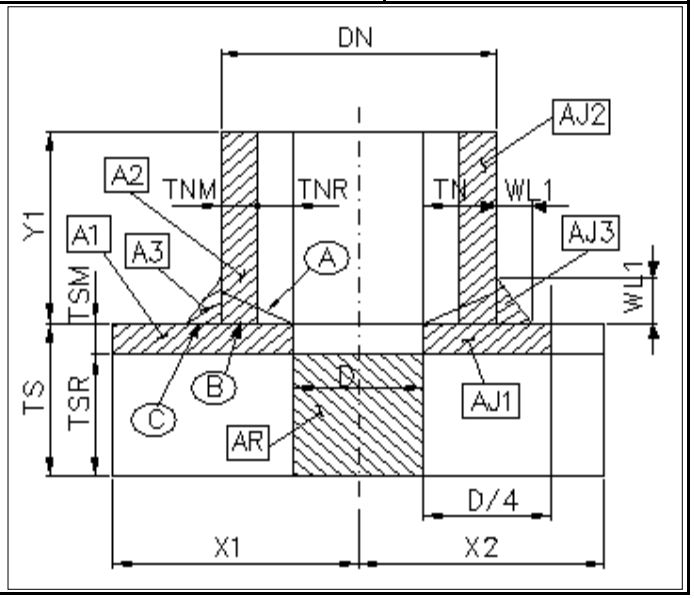
WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36) TYPE(K-4)

COMB. NO. : N/A NOZZLE NO. :2 HP 1st ECO. OUTLET UPPER HEADER NOZZLE(1HC5) P=15100(kPa) TEMP.=344.0(^C)

SHELL				NOZZLE			
MATERIAL	SA106-C	E	1.000	MATERIAL	SA106-C	E	1.000
SS(kPa)	136268	y	0.400	SN(kPa)	136268	D(mm)	119.00
DS(mm)	168.30	C(mm)	0.00	DN(mm)	141.30	WL1(mm)	9.00
Dis(mm)	129.89	F	1.000	Din(mm)	119.08		
TS(mm)	19.21			TN(mm)	11.11		
TSR(mm)	$\frac{PDis}{2\cdot SS\cdot E-2(1-y)P}+C$		7.71	TNR(mm)	$\frac{PDin}{2\cdot SN\cdot E-2(1-y)P}$		7.07
TSM(mm)	ExTS-FxTSR		11.50	TNM(mm)	TN-TNR		4.05

X1=X2 (mm)	D	MAX.
	D/2+(TS+TN)	119.00
Y1 (mm)	2.5xTS	MIN.
	2.5xTN	27.78



REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36)

COMB. NO. : N/A NOZZLE NO. :2 HP 1st ECO. OUTLET UPPER HEADER NOZZLE(1HC5)

			LARGE OPENINGS (ACCORDING TO PAR. PG-32.3.2 AND PG-32.3.3)		
AR (mm²)	D x TSR x F	917	AJR (mm²)	2/3 x AR	612
A1 (mm²)	(X1 + X2 - D) x TSM	1368	AJ1 (mm²)	D/2 x TSM	684
A2 (mm²)	2 x Y1 x TNM x SN/SS	225	AJ2 (mm²)	2 x Y1 x TNM x SN/SS	225
A3 (mm²)	WL1 x WL1	81	AJ3 (mm²)	WL1 x WL1	81
A4 (mm²)	---	---	AJ4 (mm²)	---	---
A0 (mm²)	A1 + A2 + A3	1674	AJ0 (mm²)	AJ1 + AJ2 + AJ3	990
VALUATION:	AO ≥ AR …REINFORCEMENT IS SUFFICIENT		VALUATION:	AJ0 ≥ AJR …REINFORCEMENT IS SUFFICIENT	

STRENGTH CALCULATIONS OF WELDS ARE NOT REQUIRED (ACCORDING TO PAR.PW-15.1.6)

P=15100(kPa) TEMP.=344.0(^C)

CALCULATION OF END PLATE

SHELL

FORMULA $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

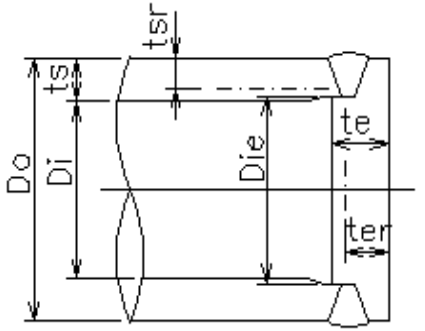
MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)
SA106-C	136268	1.000	0.400	0.00	168.30	129.89	21.95	2.74	19.21	8.93

THICKNESS CALCULATION OF END PLATE

FORMULA $ter = Die\sqrt{\frac{CP}{S}}$ (ACCORDING TO PAR. PG-31.3.2)

MATERIAL	S (kPa)	teo (mm)	Q (mm)	te (mm)	ter (mm)	-	C (0.33)	-	-	Die (mm)
SA516-70	129505	33.00	0.00	33.00	25.48	-	0.330	-	-	129.89

VALUATION:
ts.GE. 1.25xtsr…THICKNESS IS SUFFICIENT
te.GE. ter …THICKNESS IS SUFFICIENT



WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

THICKNESS CALCULATION

HP 2nd ECO. LOWER HEADER(2HC4) P=15300(kPa) TEMP.=344.0(^C)

SHELL

FORMULA $tsr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

NAME	MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)	CHECK
HP 2nd ECO. LOWER HEADER(2HC4)	SA106-C	136268	1.000	0.400	0.00	168.30	129.89	21.95	2.74	19.21	7.82	O

NOZZLE

FORMULAS (1) $tnr = \frac{PDo}{2SE + P} + 0.005Do + e$ (ACCORDING TO PAR. PG-27.2.1)

(2) $tnr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

(3) $tnr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

NOZZ NO.	NAME	FORMULA	MATERIAL	S (kPa)	E	y	e or C (mm)	Do (mm)	Di (mm)	tno (mm)	Q (mm)	tn (mm)	tnr (mm)	CHECK
1	HP 2nd ECO. TUBE(2HC3)	(1)	SA178-C	117652	1.000	---	0.80	38.10	30.70	3.70	0.00	3.70	3.29	O

MAXIMUM DIAMETER OF OPENINGS WHICH

DO NOT REQUIRE COMPENSATION P=15300(kPa) TEMP.=344.0(^C)

FORMULAS

$$Drf = MAX.(D1, D2)$$

$$D1 = MIN.(203.2\,mm, 8.084 \cdot \sqrt[3]{Do \cdot ts(1-K)})$$ (ACCORDING TO PAR. PG-32.1.2)

$$K = MIN.(0.99, \frac{PDo}{182\,S \cdot ts})$$

$$D2 = MIN.(50.8\,mm, Di/4)$$ (ACCORDING TO PAR. PG-32.1.3.1)

CONDITION $Do \cdot ts = MAX.\ 387096\ mm^2$

MATERIAL	S (kPa)	Do (mm)	Di (mm)	ts (mm)	K	Do·ts (mm²)	Di / 4 (mm)	D1 (mm)	D2 (mm)	Drf (mm)
SA106-C	136268	168.30	129.89	19.21	0.541	3232	32.47	92.23	32.47	92.23

EQUIVALENT DIAMETER OF HOLES

SHELL P=15300(kPa) TEMP.=344.0(^C)

NAME	MATERIAL	Ss (kPa)	Dos (mm)	tso (mm)	Drf (mm)
HP 2nd ECO. LOWER HEADER(2HC4)	SA106-C	136268	168.30	21.95	92.23

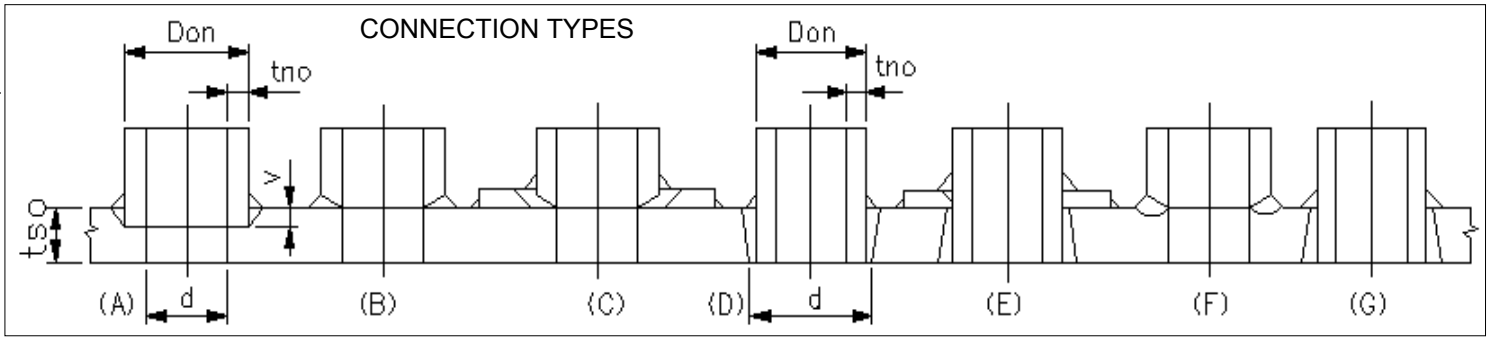
NOZZLE

$$de = \frac{ds \cdot v + d(tso - v)}{tso}$$

$$ds = Don - 2 \cdot tno \cdot K$$

$$K = MIN.(1.00, \frac{Sn}{Ss})$$

CONNECTION TYPES



VALUATIOIN

d.GT.Drf ... REINFORCEMENT

NOZZ. NO.	NAME	CONN. TYPE	MATERIAL	Sn (kPa)	Don (mm)	tno (mm)	d (mm)	v (mm)	ds (mm)	de (mm)	REINFOR. CALCUL.
1	HP 2nd ECO. TUBE(2HC3)	(F)	SA178-C	117652	38.10	3.70	30.50	---	---	30.50	NO

WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

CALCULATION EFFICIENCY (ACCORDING TO PAR. PG-52)

SHELL

NAME	Do (mm)	tso (mm)
HP 2nd ECO. LOWER HEADER(2HC4)	168.30	21.95

CONDITION E=MAX. 1.000

FORMULAS

(1)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$E = \frac{PL - dm}{PL}$$

(2)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

$$PC = \frac{\pi \cdot Dc \cdot \theta 1}{360}$$

$$E = \frac{2(PC - dm)}{PC}$$

(3)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

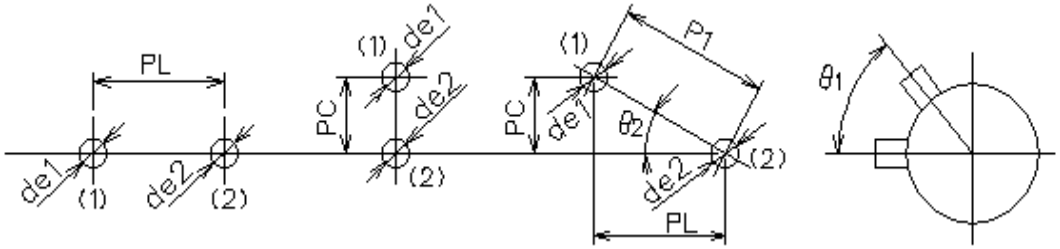
$$PC = \frac{\pi \cdot Dc \cdot \theta_1}{360}$$

$$P\,1 = \sqrt{PL^2 + PC^2}$$

$$\theta_2 = \tan^{-1}\left(\frac{PC}{PL}\right)$$

$$E = \frac{\sec^2\theta_2 + 1 - \left(\frac{\sec\theta_2}{P\,1\,/\,dm}\right)\sqrt{3 + \sec^2\theta_2}}{0.015 + 0.005 \cdot \sec^2\theta_2} / 100$$

COMB. NO.	NOZZLE HOLE (1)	NOZZLE HOLE (2)	FORM ULA	PL (mm)	PC (mm)	P1 (mm)	θ1 (DEG.)	θ2 (DEG.)	de1 (mm)	de2 (mm)	dm (mm)	E
1	1	1	(1)	96.00	---	---	---	---	30.50	30.50	30.50	0.682
2	1	1	(2)	---	79.18	---	62.00	---	30.50	30.50	30.50	1.000
3	1	1	(3)	48.00	39.59	62.22	31.00	39.52	30.50	30.50	30.50	0.558



SHELL THICKNESS BY EFFICIENCY OF LIGAMENT (ACCORDING TO PAR. PG-52 AND PG-53

SHELL P=15300(kPa) TEMP.=344.0(^C)

NAME	MATERIAL	S (kPa)	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)
HP 2nd ECO. LOWER HEADER(2HC4)	SA106-C	136268	0.400	0.00	168.30	129.89	21.95	2.74	19.21

FORMULAS

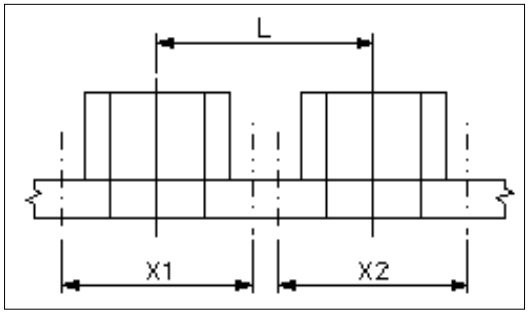
(1) $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

(2) $tsr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

VALUATION

ts.GT.tsr …THICKNESS IS SUFFICIENT
(X1+X2)/2 .GT.L …MULTI OPENING CALCULATION.

COMB. NO.	FORMULA	E	tsr (mm)	CHECK	REINFOR. CALCUL.	X1 (mm)	X2 (mm)	L (mm)	MULTI OPEN. CALCUL.
1	(2)	0.682	11.86	O	NO	---	---	---	---
2	(2)	1.000	7.82	O	NO	---	---	---	---
3	(2)	0.558	14.86	O	NO	---	---	---	---



P=15300(kPa) TEMP.=344.0(^C)

CALCULATION OF END PLATE

SHELL

FORMULA $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

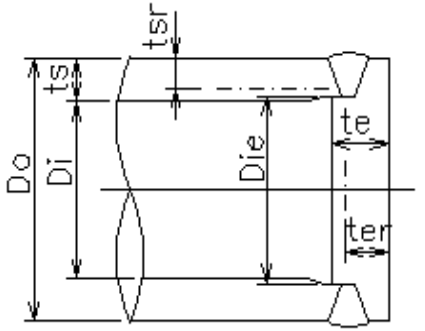
MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)
SA106-C	136268	1.000	0.400	0.00	168.30	129.89	21.95	2.74	19.21	9.04

THICKNESS CALCULATION OF END PLATE

FORMULA $ter = Die\sqrt{\frac{CP}{S}}$ (ACCORDING TO PAR. PG-31.3.2)

MATERIAL	S (kPa)	teo (mm)	Q (mm)	te (mm)	ter (mm)	-	C (0.33)	-	-	Die (mm)
SA516-70	129505	33.00	0.00	33.00	25.65	-	0.330	-	-	129.89

VALUATION:
ts.GE. 1.25xtsr…THICKNESS IS SUFFICIENT
te.GE. ter …THICKNESS IS SUFFICIENT



WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

THICKNESS CALCULATION

HP EVA. OUTLET UPPER HEADER(HV7,HV8) P=10500(kPa) TEMP.=316.0(^C)

SHELL

FORMULA $$tsr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NAME	MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)	CHECK
HP EVA. OUTLET UPPER HEADER(HV7,HV8)	SA106-C	137873	1.000	0.400	0.00	219.10	187.15	18.26	2.28	15.98	7.47	O

NOZZLE

FORMULAS

(1) $$tnr = \frac{PDo}{2SE + P} + 0.005Do + e$$ (ACCORDING TO PAR. PG-27.2.1)

(2) $$tnr = \frac{PDo}{2SE + 2yP} + C$$ (ACCORDING TO PAR. PG-27.2.2)

(3) $$tnr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NOZZ NO.	NAME	FORMULA	MATERIAL	S (kPa)	E	y	e or C (mm)	Do (mm)	Di (mm)	tno (mm)	Q (mm)	tn (mm)	tnr (mm)	CHECK
1	HP EVA. TUBE(HV6)	(1)	SA192	87193	1.000	---	0.00	38.10	33.30	2.40	0.00	2.40	2.35	O
2	HP EVA. OUTLET UPPER HEADER NOZZLE(HV7,HV8)	(3)	SA106-C	137873	1.000	0.400	0.00	168.30	149.10	10.97	1.37	9.60	5.95	O

MAXIMUM DIAMETER OF OPENINGS WHICH

DO NOT REQUIRE COMPENSATION P=10500(kPa) TEMP.=316.0(^C)

FORMULAS

$$Drf = MAX.(D1, D2)$$

$$D1 = MIN.(203.2\,mm, 8.084 \cdot \sqrt[3]{Do \cdot ts(1-K)})$$ (ACCORDING TO PAR. PG-32.1.2)

$$K = MIN.(0.99, \frac{PDo}{182\,S \cdot ts})$$

$$D2 = MIN.(50.8\,mm, Di/4)$$ (ACCORDING TO PAR. PG-32.1.3.1)

CONDITION $Do \cdot ts = MAX.\ 387096\ mm^2$

MATERIAL	S (kPa)	Do (mm)	Di (mm)	ts (mm)	K	Do·ts (mm²)	Di / 4 (mm)	D1 (mm)	D2 (mm)	Drf (mm)
SA106-C	137873	219.10	187.15	15.98	0.574	3501	46.79	92.37	46.79	92.37

WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

EQUIVALENT DIAMETER OF HOLES

SHELL P=10500(kPa) TEMP.=316.0(^C)

NAME	MATERIAL	Ss (kPa)	Dos (mm)	tso (mm)	Drf (mm)
HP EVA. OUTLET UPPER HEADER(HV7,HV8)	SA106-C	137873	219.10	18.26	92.37

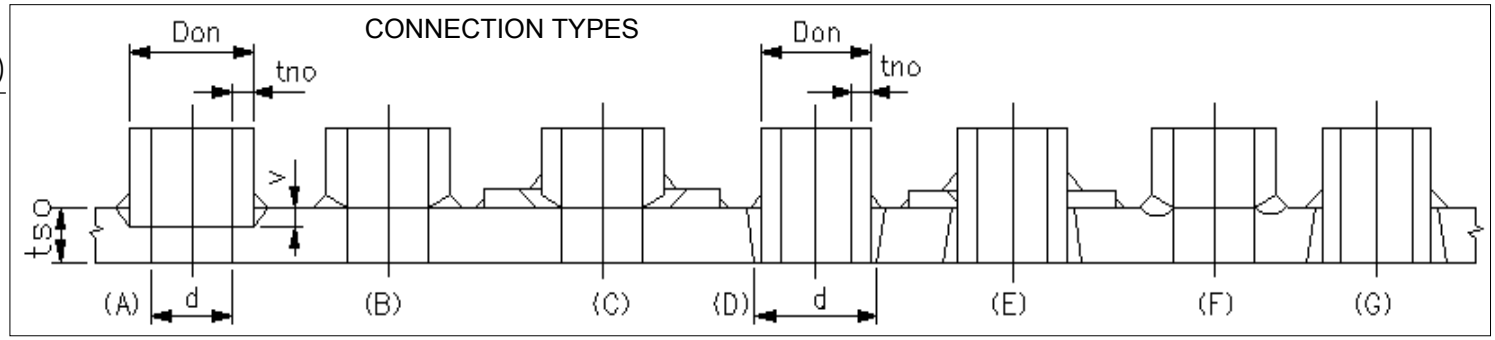
NOZZLE

$$de = \frac{ds \cdot v + d(tso - v)}{tso}$$

$$ds = Don - 2 \cdot tno \cdot K$$

$$K = MIN.(1.00, \frac{Sn}{Ss})$$

CONNECTION TYPES



VALUATIOIN

d.GT.Drf ... REINFORCEMENT

NOZZ. NO.	NAME	CONN. TYPE	MATERIAL	Sn (kPa)	Don (mm)	tno (mm)	d (mm)	v (mm)	ds (mm)	de (mm)	REINFOR. CALCUL.
1	HP EVA. TUBE(HV6)	(F)	SA192	87193	38.10	2.40	33.00	---	---	33.00	NO
2	HP EVA. OUTLET UPPER HEADER NOZZLE(HV7,HV8)	(B)	SA106-C	137873	168.30	10.97	149.00	---	---	149.00	YES

WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

CALCULATION EFFICIENCY (ACCORDING TO PAR. PG-52)

SHELL

NAME	Do (mm)	tso (mm)
HP EVA. OUTLET UPPER HEADER(HV7,HV8)	219.10	18.26

CONDITION E=MAX. 1.000

FORMULAS

(1)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$E = \frac{PL - dm}{PL}$$

(2)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

$$PC = \frac{\pi \cdot Dc \cdot \theta 1}{360}$$

$$E = \frac{2(PC - dm)}{PC}$$

(3)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

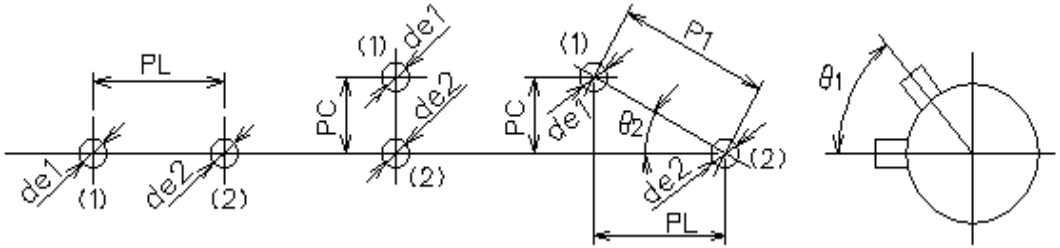
$$PC = \frac{\pi \cdot Dc \cdot \theta_1}{360}$$

$$P1 = \sqrt{PL^2 + PC^2}$$

$$\theta_2 = \tan^{-1}\left(\frac{PC}{PL}\right)$$

$$E = \frac{\sec^2\theta_2 + 1 - \left(\frac{\sec\theta_2}{P1/dm}\right)\sqrt{3 + \sec^2\theta_2}}{0.015 + 0.005 \cdot \sec^2\theta_2} / 100$$

COMB. NO.	NOZZLE HOLE (1)	NOZZLE HOLE (2)	FORM ULA	PL (mm)	PC (mm)	P1 (mm)	θ1 (DEG.)	θ2 (DEG.)	de1 (mm)	de2 (mm)	dm (mm)	E
1	1	1	(1)	96.00	---	---	---	---	33.00	33.00	33.00	0.656
2	1	1	(2)	---	94.64	---	54.00	---	33.00	33.00	33.00	1.000
3	1	1	(3)	48.00	47.32	67.40	27.00	44.59	33.00	33.00	33.00	0.579



SHELL THICKNESS BY EFFICIENCY OF LIGAMENT (ACCORDING TO PAR. PG-52 AND PG-53

SHELL P=10500(kPa) TEMP.=316.0(^C)

NAME	MATERIAL	S (kPa)	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)
HP EVA. OUTLET UPPER HEADER(HV7,HV8)	SA106-C	137873	0.400	0.00	219.10	187.15	18.26	2.28	15.98

FORMULAS

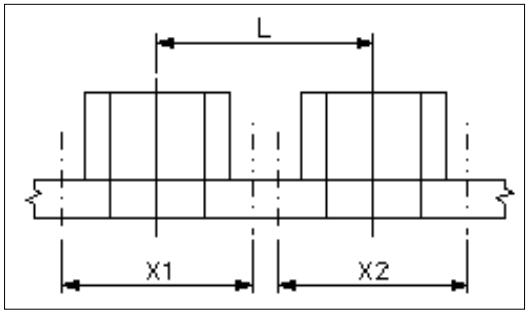
(1) $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

(2) $tsr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

VALUATION

ts.GT.tsr …THICKNESS IS SUFFICIENT
(X1+X2)/2 .GT.L …MULTI OPENING CALCULATION.

COMB. NO.	FORMULA	E	tsr (mm)	CHECK	REINFOR. CALCUL.	X1 (mm)	X2 (mm)	L (mm)	MULTI OPEN. CALCUL.
1	(2)	0.656	11.67	O	NO	---	---	---	---
2	(2)	1.000	7.47	O	NO	---	---	---	---
3	(2)	0.579	13.37	O	NO	---	---	---	---



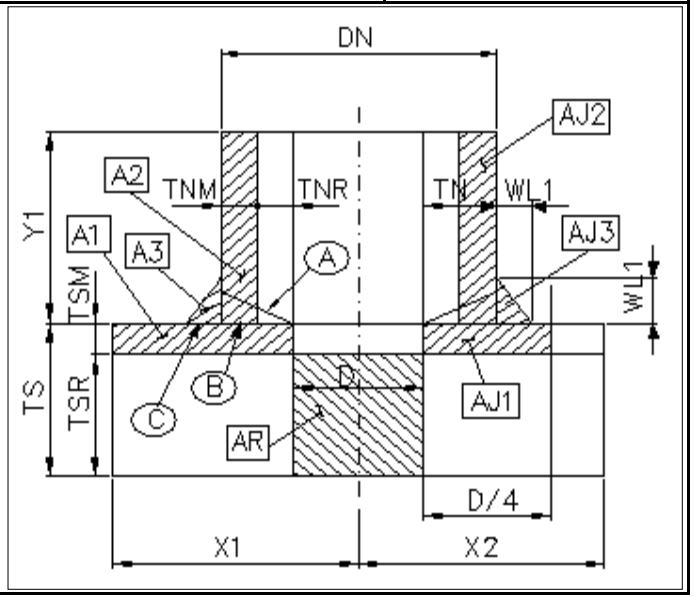
WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36) TYPE(K-4)

COMB. NO. : N/A NOZZLE NO. :2 HP EVA. OUTLET UPPER HEADER NOZZLE(HV7,HV8) P=10500(kPa) TEMP.=316.0(^C)

SHELL				NOZZLE			
MATERIAL	SA106-C	E	1.000	MATERIAL	SA106-C	E	1.000
SS(kPa)	137873	y	0.400	SN(kPa)	137873	D(mm)	149.00
DS(mm)	219.10	C(mm)	0.00	DN(mm)	168.30	WL1(mm)	9.00
Dis(mm)	187.15	F	1.000	Din(mm)	149.10		
TS(mm)	15.98			TN(mm)	9.60		
TSR(mm)	$\frac{PDis}{2\cdot SS\cdot E-2(1-y)P}+C$		7.47	TNR(mm)	$\frac{PDin}{2\cdot SN\cdot E-2(1-y)P}$		5.95
TSM(mm)	ExTS-FxTSR		8.51	TNM(mm)	TN-TNR		3.65

X1=X2 (mm)	D	MAX.
	D/2+(TS+TN)	149.00
Y1 (mm)	2.5xTS	MIN.
	2.5xTN	24.00



REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36)

COMB. NO. : N/A NOZZLE NO. :2 HP EVA. OUTLET UPPER HEADER NOZZLE(HV7,HV8)

			LARGE OPENINGS (ACCORDING TO PAR. PG-32.3.2 AND PG-32.3.3)		
AR (mm²)	D x TSR x F	1113	AJR (mm²)	2/3 x AR	742
A1 (mm²)	(X1 + X2 - D) x TSM	1268	AJ1 (mm²)	D/2 x TSM	634
A2 (mm²)	2 x Y1 x TNM x SN/SS	175	AJ2 (mm²)	2 x Y1 x TNM x SN/SS	175
A3 (mm²)	WL1 x WL1	81	AJ3 (mm²)	WL1 x WL1	81
A4 (mm²)	---	---	AJ4 (mm²)	---	---
A0 (mm²)	A1 + A2 + A3	1524	AJ0 (mm²)	AJ1 + AJ2 + AJ3	890
VALUATION:	AO ≥ AR …REINFORCEMENT IS SUFFICIENT		VALUATION:	AJ0 ≥ AJR …REINFORCEMENT IS SUFFICIENT	

STRENGTH CALCULATIONS OF WELDS ARE NOT REQUIRED (ACCORDING TO PAR.PW-15.1.6)

P=10500(kPa) TEMP.=316.0(^C)

CALCULATION OF END PLATE

SHELL

FORMULA $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

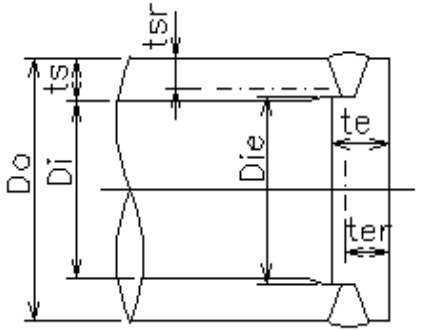
MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)
SA106-C	137873	1.000	0.400	0.00	219.10	187.15	18.26	2.28	15.98	8.10

THICKNESS CALCULATION OF END PLATE

FORMULA $ter = Die\sqrt{\frac{CP}{S}}$ (ACCORDING TO PAR. PG-31.3.2)

MATERIAL	S (kPa)	teo (mm)	Q (mm)	te (mm)	ter (mm)	-	C (0.33)	-	-	Die (mm)
SA516-70	133692	33.00	0.00	33.00	30.13	-	0.330	-	-	187.15

VALUATION:
ts.GE. 1.25xtsr…THICKNESS IS SUFFICIENT
te.GE. ter …THICKNESS IS SUFFICIENT



THICKNESS CALCULATION

HP 2nd SH INLET UPPER HEADER(2HS1) P=10500(kPa) TEMP.=446.0(^C)

SHELL

FORMULA $tsr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

NAME	MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)	CHECK
HP 2nd SH INLET UPPER HEADER(2HS1)	SA335-P22	114453	1.000	0.400	0.00	219.10	183.02	20.62	2.58	18.04	8.88	O

NOZZLE

FORMULAS (1) $tnr = \frac{PDo}{2SE + P} + 0.005Do + e$ (ACCORDING TO PAR. PG-27.2.1)

(2) $tnr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

(3) $tnr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

NOZZ NO.	NAME	FORMULA	MATERIAL	S (kPa)	E	y	e or C (mm)	Do (mm)	Di (mm)	tno (mm)	Q (mm)	tn (mm)	tnr (mm)	CHECK
1	HP 1st&2nd SH OUT&INLET UPPER HEADER NOZZLE(1HS6,2H1)	(3)	SA335-P22	114453	1.000	0.400	0.00	168.30	149.10	10.97	1.37	9.60	7.24	O
2	HP 2nd SH TUBE(2HS2)	(1)	SA213-T22	61953	1.000	---	0.00	38.10	31.70	3.20	0.00	3.20	3.17	O

MAXIMUM DIAMETER OF OPENINGS WHICH

DO NOT REQUIRE COMPENSATION P=10500(kPa) TEMP.=446.0(^C)

FORMULAS

$$Drf = MAX.(D1, D2)$$

$$D1 = MIN.(203.2\,mm, 8.084 \cdot \sqrt[3]{Do \cdot ts(1-K)})$$ (ACCORDING TO PAR. PG-32.1.2)

$$K = MIN.(0.99, \frac{PDo}{182\,S \cdot ts})$$

$$D2 = MIN.(50.8\,mm, Di/4)$$ (ACCORDING TO PAR. PG-32.1.3.1)

CONDITION $Do \cdot ts = MAX.\ 387096\ mm^2$

MATERIAL	S (kPa)	Do (mm)	Di (mm)	ts (mm)	K	Do·ts (mm²)	Di / 4 (mm)	D1 (mm)	D2 (mm)	Drf (mm)
SA335-P22	114453	219.10	183.02	18.04	0.612	3953	45.75	93.22	45.75	93.22

WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

EQUIVALENT DIAMETER OF HOLES

SHELL P=10500(kPa) TEMP.=446.0(^C)

NAME	MATERIAL	Ss (kPa)	Dos (mm)	tso (mm)	Drf (mm)
HP 2nd SH INLET UPPER HEADER(2HS1)	SA335-P22	114453	219.10	20.62	93.22

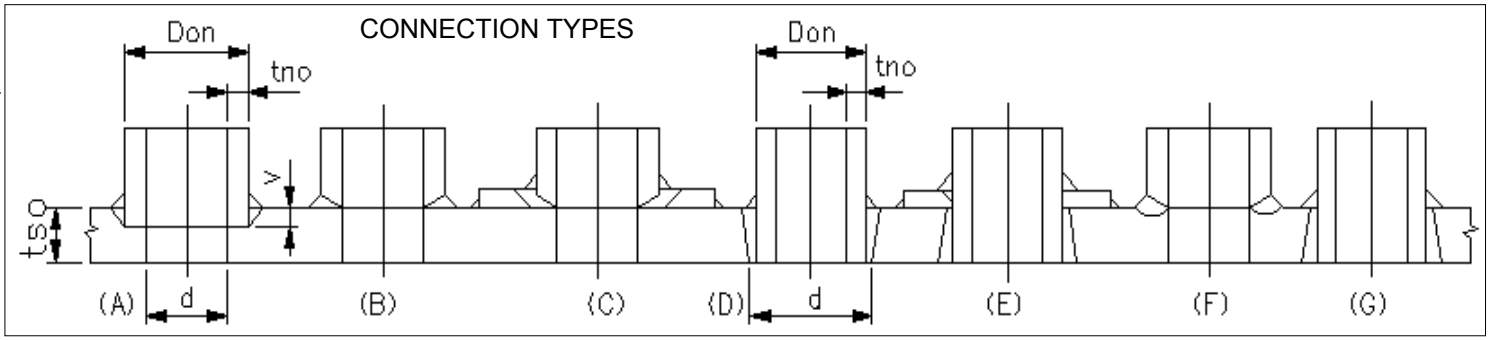
NOZZLE

$$de = \frac{ds \cdot v + d(tso - v)}{tso}$$

$$ds = Don - 2 \cdot tno \cdot K$$

$$K = MIN.(1.00, \frac{Sn}{Ss})$$

CONNECTION TYPES



VALUATIOIN

d.GT.Drf ... REINFORCEMENT

NOZZ. NO.	NAME	CONN. TYPE	MATERIAL	Sn (kPa)	Don (mm)	tno (mm)	d (mm)	v (mm)	ds (mm)	de (mm)	REINFOR. CALCUL.
1	HP 1st&2nd SH OUT&INLET UPPER HEADER NOZZLE(1HS6,2H1)	(B)	SA335-P22	114453	168.30	10.97	149.00	---	---	149.00	YES
2	HP 2nd SH TUBE(2HS2)	(F)	SA213-T22	61953	38.10	3.20	31.50	---	---	31.50	NO

WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

CALCULATION EFFICIENCY (ACCORDING TO PAR. PG-52)

SHELL

NAME	Do (mm)	tso (mm)
HP 2nd SH INLET UPPER HEADER(2HS1)	219.10	20.62

CONDITION E=MAX. 1.000

FORMULAS

(1)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$E = \frac{PL - dm}{PL}$$

(2)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

$$PC = \frac{\pi \cdot Dc \cdot \theta 1}{360}$$

$$E = \frac{2(PC - dm)}{PC}$$

(3)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

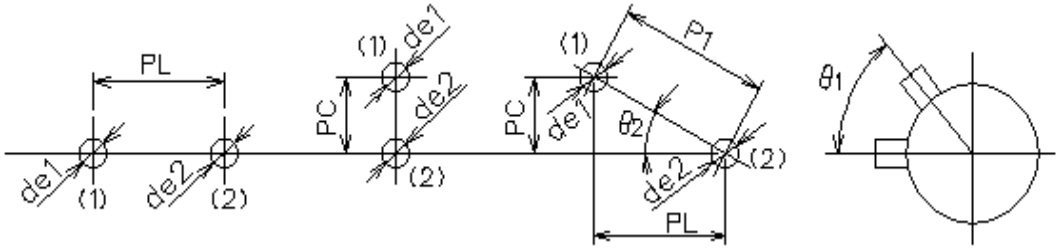
$$PC = \frac{\pi \cdot Dc \cdot \theta_1}{360}$$

$$P1 = \sqrt{PL^2 + PC^2}$$

$$\theta_2 = \tan^{-1}\left(\frac{PC}{PL}\right)$$

$$E = \frac{\sec^2\theta_2 + 1 - \left(\frac{\sec\theta_2}{P1/dm}\right)\sqrt{3 + \sec^2\theta_2}}{0.015 + 0.005 \cdot \sec^2\theta_2} / 100$$

COMB. NO.	NOZZLE HOLE (1)	NOZZLE HOLE (2)	FORM ULA	PL (mm)	PC (mm)	P1 (mm)	θ1 (DEG.)	θ2 (DEG.)	de1 (mm)	de2 (mm)	dm (mm)	E
1	2	2	(1)	96.00	---	---	---	---	31.50	31.50	31.50	0.672
2	2	2	(2)	---	93.53	---	54.00	---	31.50	31.50	31.50	1.000
3	2	2	(3)	48.00	46.77	67.02	27.00	44.25	31.50	31.50	31.50	0.602



SHELL THICKNESS BY EFFICIENCY OF LIGAMENT (ACCORDING TO PAR. PG-52 AND PG-53

SHELL P=10500(kPa) TEMP.=446.0(^C)

NAME	MATERIAL	S (kPa)	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)
HP 2nd SH INLET UPPER HEADER(2HS1)	SA335-P22	114453	0.400	0.00	219.10	183.02	20.62	2.58	18.04

FORMULAS

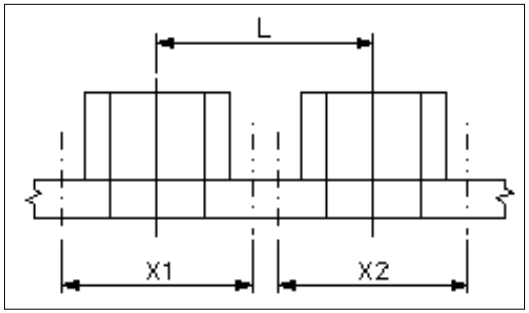
(1) $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

(2) $tsr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

VALUATION

ts.GT.tsr …THICKNESS IS SUFFICIENT
(X1+X2)/2 .GT.L …MULTI OPENING CALCULATION.

COMB. NO.	FORMULA	E	tsr (mm)	CHECK	REINFOR. CALCUL.	X1 (mm)	X2 (mm)	L (mm)	MULTI OPEN. CALCUL.
1	(2)	0.672	13.61	O	NO	---	---	---	---
2	(2)	1.000	8.88	O	NO	---	---	---	---
3	(2)	0.602	15.35	O	NO	---	---	---	---



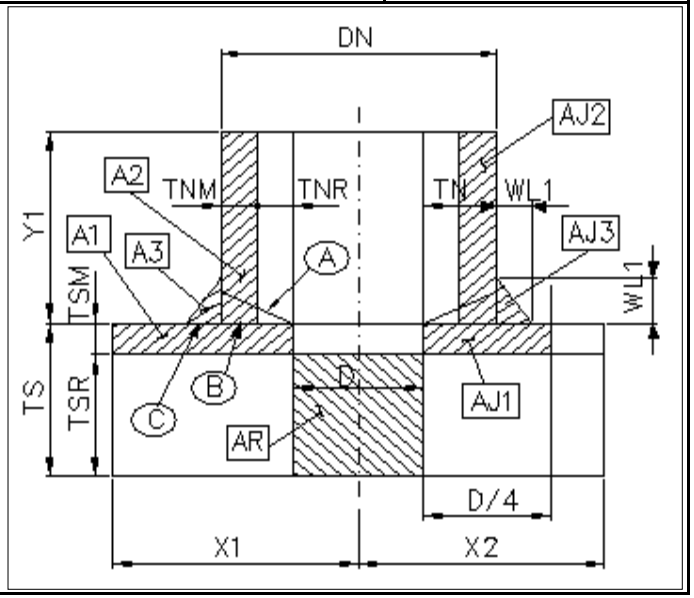
WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36) TYPE(K-4)

COMB. NO. : N/A NOZZLE NO. :1 HP 1st&2nd SH OUT&INLET UPPER HEADER NOZZLE(1HS6,2 P=10500(kPa) TEMP.=446.0(^C)

SHELL				NOZZLE			
MATERIAL	SA335-P22	E	1.000	MATERIAL	SA335-P22	E	1.000
SS(kPa)	114453	y	0.400	SN(kPa)	114453	D(mm)	149.00
DS(mm)	219.10	C(mm)	0.00	DN(mm)	168.30	WL1(mm)	11.00
Dis(mm)	183.02	F	1.000	Din(mm)	149.10		
TS(mm)	18.04			TN(mm)	9.60		
TSR(mm)	$\frac{PDis}{2\cdot SS\cdot E-2(1-y)P}+C$		8.88	TNR(mm)	$\frac{PDin}{2\cdot SN\cdot E-2(1-y)P}$		7.24
TSM(mm)	ExTS-FxTSR		9.16	TNM(mm)	TN-TNR		2.36

X1=X2 (mm)	D	MAX.
	D/2+(TS+TN)	149.00
Y1 (mm)	2.5xTS	MIN.
	2.5xTN	24.00



REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36)

COMB. NO. : N/A NOZZLE NO. :1 HP 1st&2nd SH OUT&INLET UPPER HEADER NOZZLE(1HS6,2H1)

			LARGE OPENINGS (ACCORDING TO PAR. PG-32.3.2 AND PG-32.3.3)		
AR (mm²)	D x TSR x F	1324	AJR (mm²)	2/3 x AR	882
A1 (mm²)	(X1 + X2 - D) x TSM	1365	AJ1 (mm²)	D/2 x TSM	682
A2 (mm²)	2 x Y1 x TNM x SN/SS	113	AJ2 (mm²)	2 x Y1 x TNM x SN/SS	113
A3 (mm²)	WL1 x WL1	121	AJ3 (mm²)	WL1 x WL1	121
A4 (mm²)	---	---	AJ4 (mm²)	---	---
A0 (mm²)	A1 + A2 + A3	1599	AJ0 (mm²)	AJ1 + AJ2 + AJ3	917
VALUATION:	AO ≥ AR …REINFORCEMENT IS SUFFICIENT		VALUATION:	AJ0 ≥ AJR …REINFORCEMENT IS SUFFICIENT	

STRENGTH CALCULATIONS OF WELDS ARE NOT REQUIRED (ACCORDING TO PAR.PW-15.1.6)

P=10500(kPa) TEMP.=446.0(^C)

CALCULATION OF END PLATE

SHELL

FORMULA $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

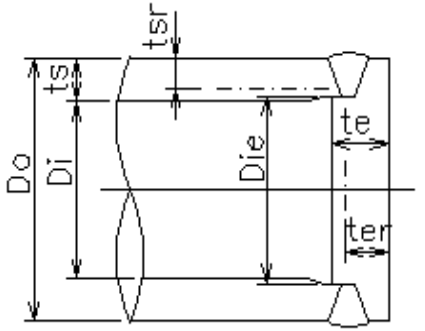
MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)
SA335-P22	114453	1.000	0.400	0.00	219.10	183.02	20.62	2.58	18.04	9.69

THICKNESS CALCULATION OF END PLATE

FORMULA $ter = Die\sqrt{\frac{CP}{S}}$ (ACCORDING TO PAR. PG-31.3.2)

MATERIAL	S (kPa)	teo (mm)	Q (mm)	te (mm)	ter (mm)	-	C (0.33)	-	-	Die (mm)
SA387-22-2	130189	53.00	0.00	53.00	29.86	-	0.330	-	-	183.02

VALUATION:
ts.GE. 1.25xtsr…THICKNESS IS SUFFICIENT
te.GE. ter …THICKNESS IS SUFFICIENT



WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

THICKNESS CALCULATION

HP 2nd SH OUTLET LOWER HEADER(2HS3) P=10500(kPa) TEMP.=516.0(^C)

SHELL

FORMULA $$tsr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NAME	MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)	CHECK
HP 2nd SH OUTLET LOWER HEADER(2HS3)	SA335-P22	70293	1.000	0.540	0.00	219.10	166.60	30.00	3.75	26.25	13.36	O

NOZZLE

FORMULAS

(1) $$tnr = \frac{PDo}{2SE + P} + 0.005Do + e$$ (ACCORDING TO PAR. PG-27.2.1)

(2) $$tnr = \frac{PDo}{2SE + 2yP} + C$$ (ACCORDING TO PAR. PG-27.2.2)

(3) $$tnr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NOZZ NO.	NAME	FORMULA	MATERIAL	S (kPa)	E	y	e or C (mm)	Do (mm)	Di (mm)	tno (mm)	Q (mm)	tn (mm)	tnr (mm)	CHECK
1	HP 2nd SH TUBE(2HS2)	(1)	SA213-T22	61953	1.000	---	0.00	38.10	31.70	3.20	0.00	3.20	3.17	O
2	HP 2nd SH OUTLET LOWER HEADER NOZZLE(2HS3)	(3)	SA335-P22	70293	1.000	0.540	0.00	168.30	136.35	18.26	2.28	15.98	10.93	O

MAXIMUM DIAMETER OF OPENINGS WHICH

DO NOT REQUIRE COMPENSATION P=10500(kPa) TEMP.=516.0(^C)

FORMULAS

$$Drf = MAX.(D1, D2)$$

$$D1 = MIN.(203.2\,mm, 8.084 \cdot \sqrt[3]{Do \cdot ts(1-K)})$$ (ACCORDING TO PAR. PG-32.1.2)

$$K = MIN.(0.99, \frac{PDo}{182\,S \cdot ts})$$

$$D2 = MIN.(50.8\,mm, Di/4)$$ (ACCORDING TO PAR. PG-32.1.3.1)

CONDITION $Do \cdot ts = MAX.\ 387096\ mm^2$

MATERIAL	S (kPa)	Do (mm)	Di (mm)	ts (mm)	K	Do·ts (mm²)	Di / 4 (mm)	D1 (mm)	D2 (mm)	Drf (mm)
SA335-P22	70293	219.10	166.60	26.25	0.685	5751	41.65	98.55	41.65	98.55

WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

EQUIVALENT DIAMETER OF HOLES

SHELL P=10500(kPa) TEMP.=516.0(^C)

NAME	MATERIAL	Ss (kPa)	Dos (mm)	tso (mm)	Drf (mm)
HP 2nd SH OUTLET LOWER HEADER(2HS3)	SA335-P22	70293	219.10	30.00	98.55

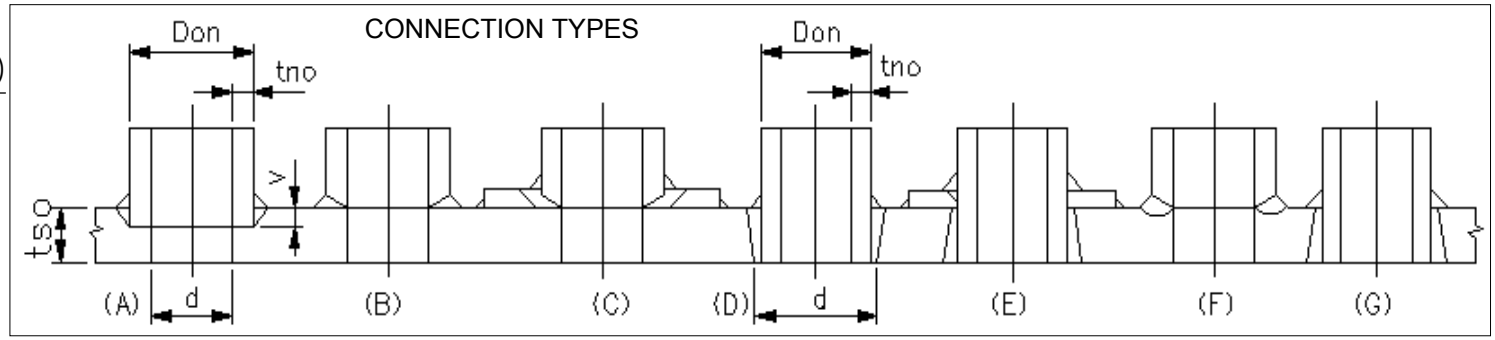
NOZZLE

$$de = \frac{ds \cdot v + d(tso - v)}{tso}$$

$$ds = Don - 2 \cdot tno \cdot K$$

$$K = MIN.(1.00, \frac{Sn}{Ss})$$

CONNECTION TYPES



VALUATIOIN

d.GT.Drf ... REINFORCEMENT

NOZZ. NO.	NAME	CONN. TYPE	MATERIAL	Sn (kPa)	Don (mm)	tno (mm)	d (mm)	v (mm)	ds (mm)	de (mm)	REINFOR. CALCUL.
1	HP 2nd SH TUBE(2HS2)	(F)	SA213-T22	61953	38.10	3.20	31.50	---	---	31.50	NO
2	HP 2nd SH OUTLET LOWER HEADER NOZZLE(2HS3)	(B)	SA335-P22	70293	168.30	18.26	136.00	---	---	136.00	YES

CALCULATION EFFICIENCY (ACCORDING TO PAR. PG-52)

SHELL

NAME	Do (mm)	tso (mm)
HP 2nd SH OUTLET LOWER HEADER(2HS3)	219.10	30.00

CONDITION E=MAX. 1.000

FORMULAS

(1)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$E = \frac{PL - dm}{PL}$$

(2)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

$$PC = \frac{\pi \cdot Dc \cdot \theta 1}{360}$$

$$E = \frac{2(PC - dm)}{PC}$$

(3)

$$dm = \frac{de\,1 + de\,2}{2}$$

$$Dc = Do - tso$$

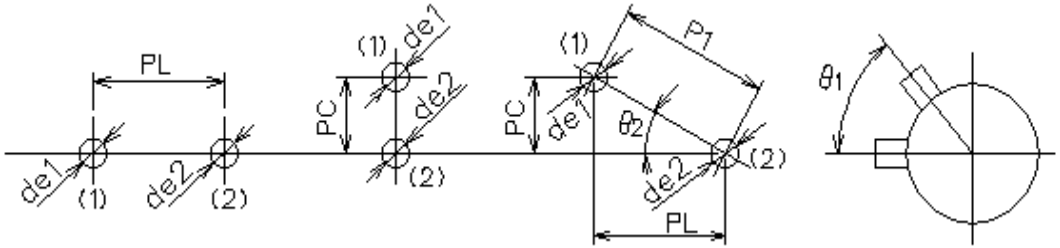
$$PC = \frac{\pi \cdot Dc \cdot \theta_1}{360}$$

$$P1 = \sqrt{PL^2 + PC^2}$$

$$\theta_2 = \tan^{-1}\left(\frac{PC}{PL}\right)$$

$$E = \frac{\sec^2\theta_2 + 1 - \left(\frac{\sec\theta_2}{P1/dm}\right)\sqrt{3 + \sec^2\theta_2}}{0.015 + 0.005 \cdot \sec^2\theta_2} / 100$$

COMB. NO.	NOZZLE HOLE (1)	NOZZLE HOLE (2)	FORM ULA	PL (mm)	PC (mm)	P1 (mm)	θ1 (DEG.)	θ2 (DEG.)	de1 (mm)	de2 (mm)	dm (mm)	E
1	1	1	(1)	96.00	---	---	---	---	31.50	31.50	31.50	0.672
2	1	1	(2)	---	89.11	---	54.00	---	31.50	31.50	31.50	1.000
3	1	1	(3)	48.00	44.56	65.49	27.00	42.87	31.50	31.50	31.50	0.582



SHELL THICKNESS BY EFFICIENCY OF LIGAMENT (ACCORDING TO PAR. PG-52 AND PG-53

SHELL P=10500(kPa) TEMP.=516.0(^C)

NAME	MATERIAL	S (kPa)	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)
HP 2nd SH OUTLET LOWER HEADER(2HS3)	SA335-P22	70293	0.540	0.00	219.10	166.60	30.00	3.75	26.25

FORMULAS

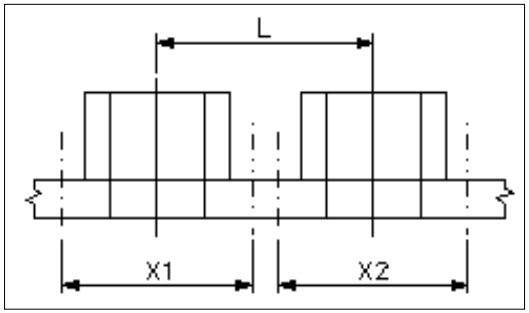
(1) $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

(2) $tsr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

VALUATION

ts.GT.tsr …THICKNESS IS SUFFICIENT
(X1+X2)/2 .GT.L …MULTI OPENING CALCULATION.

COMB. NO.	FORMULA	E	tsr (mm)	CHECK	REINFOR. CALCUL.	X1 (mm)	X2 (mm)	L (mm)	MULTI OPEN. CALCUL.
1	(2)	0.672	20.63	O	NO	---	---	---	---
2	(2)	1.000	13.36	O	NO	---	---	---	---
3	(2)	0.582	24.24	O	NO	---	---	---	---



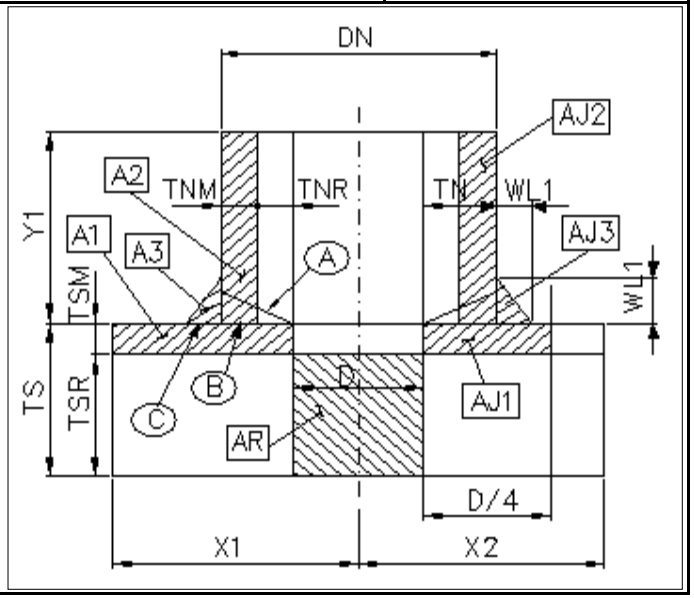
WORK NO.: PJT040602 WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0001 Rev.A

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36) TYPE(K-4)

COMB. NO. : N/A NOZZLE NO. :2 HP 2nd SH OUTLET LOWER HEADER NOZZLE(2HS3) P=10500(kPa) TEMP.=516.0(^C)

SHELL				NOZZLE			
MATERIAL	SA335-P22	E	1.000	MATERIAL	SA335-P22	E	1.000
SS(kPa)	70293	y	0.540	SN(kPa)	70293	D(mm)	136.00
DS(mm)	219.10	C(mm)	0.00	DN(mm)	168.30	WL1(mm)	9.00
Dis(mm)	166.60	F	1.000	Din(mm)	136.35		
TS(mm)	26.25			TN(mm)	15.98		
TSR(mm)	$\frac{PDis}{2\cdot SS\cdot E-2(1-y)P}+C$		13.36	TNR(mm)	$\frac{PDin}{2\cdot SN\cdot E-2(1-y)P}$		10.93
TSM(mm)	ExTS-FxTSR		12.89	TNM(mm)	TN-TNR		5.04

X1=X2 (mm)	D	MAX.
	D/2+(TS+TN)	136.00
Y1 (mm)	2.5xTS	MIN.
	2.5xTN	39.94



REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36)

COMB. NO. : N/A NOZZLE NO. :2 HP 2nd SH OUTLET LOWER HEADER NOZZLE(2HS3)

			LARGE OPENINGS (ACCORDING TO PAR. PG-32.3.2 AND PG-32.3.3)		
AR (mm²)	D x TSR x F	1817	AJR (mm²)	2/3 x AR	1211
A1 (mm²)	(X1 + X2 - D) x TSM	1753	AJ1 (mm²)	D/2 x TSM	876
A2 (mm²)	2 x Y1 x TNM x SN/SS	403	AJ2 (mm²)	2 x Y1 x TNM x SN/SS	403
A3 (mm²)	WL1 x WL1	81	AJ3 (mm²)	WL1 x WL1	81
A4 (mm²)	---	---	AJ4 (mm²)	---	---
A0 (mm²)	A1 + A2 + A3	2237	AJ0 (mm²)	AJ1 + AJ2 + AJ3	1360
VALUATION:	AO ≥ AR …REINFORCEMENT IS SUFFICIENT		VALUATION:	AJ0 ≥ AJR …REINFORCEMENT IS SUFFICIENT	

STRENGTH CALCULATIONS OF WELDS ARE NOT REQUIRED (ACCORDING TO PAR.PW-15.1.6)

P=10500(kPa) TEMP.=516.0(^C)

CALCULATION OF END PLATE

SHELL

FORMULA $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

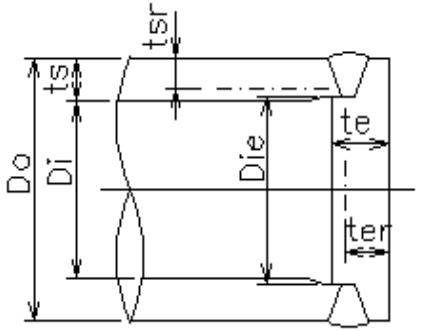
MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)
SA335-P22	70293	1.000	0.540	0.00	219.10	166.60	30.00	3.75	26.25	15.14

THICKNESS CALCULATION OF END PLATE

FORMULA $ter = Die\sqrt{\frac{CP}{S}}$ (ACCORDING TO PAR. PG-31.3.2)

MATERIAL	S (kPa)	teo (mm)	Q (mm)	te (mm)	ter (mm)	-	C (0.33)	-	-	Die (mm)
SA387-22-2	73238	53.00	0.00	53.00	36.24	-	0.330	-	-	166.60

VALUATION:
ts.GE. 1.25xtsr…THICKNESS IS SUFFICIENT
te.GE. ter …THICKNESS IS SUFFICIENT



WORK NO.: PJT040602B WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0002B Rev.A

THICKNESS CALCULATION

CPH OUTLET MANIFOLD(CC8) P=2600(kPa) TEMP.=229.0(^C)

SHELL

FORMULA $tsr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

NAME	MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)	CHECK
CPH OUTLET MANIFOLD(CC8)	SA106-B	117900	1.000	0.400	0.00	219.10	204.79	8.18	1.02	7.16	2.29	O

NOZZLE

FORMULAS

(1) $tnr = \frac{PDo}{2SE + P} + 0.005Do + e$ (ACCORDING TO PAR. PG-27.2.1)

(2) $tnr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

(3) $tnr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

NOZZ NO.	NAME	FORMULA	MATERIAL	S (kPa)	E	y	e or C (mm)	Do (mm)	Di (mm)	tno (mm)	Q (mm)	tn (mm)	tnr (mm)	CHECK

P=2600(kPa) TEMP.=229.0(^C)

CALCULATION OF END PLATE

SHELL

FORMULA $tsr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

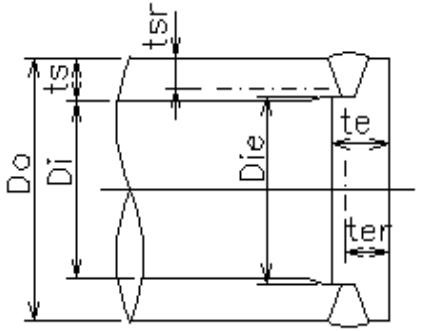
MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)
SA106-B	117900	1.000	0.400	0.00	219.10	204.79	8.18	1.02	7.16	2.39

THICKNESS CALCULATION OF END PLATE

FORMULA $ter = Die\sqrt{\frac{CP}{S}}$ (ACCORDING TO PAR. PG-31.3.2)

MATERIAL	S (kPa)	teo (mm)	Q (mm)	te (mm)	ter (mm)	-	C (0.33)	-	-	Die (mm)
SA105	136676	30.00	0.00	30.00	16.23	-	0.330	-	-	204.79

VALUATION:
ts.GE. 1.25xtsr…THICKNESS IS SUFFICIENT
te.GE. ter …THICKNESS IS SUFFICIENT



P=2600(kPa) TEMP.=229.0(^C)

HEAD PLATE

FLANGE

FORMULA $$tfr = \frac{P \cdot Di}{2SE - (1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

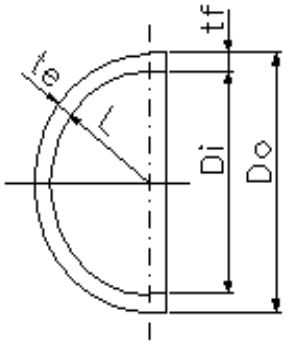
MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tfo (mm)	Q (mm)	tf (mm)	tfr (mm)
SA515-60	117900	1.000	0.400	0.00	1300.00	1200.00	50.00	0.00	50.00	13.41

THICKNESS CALCULATION OF HEAD PLATE

FORMULA $$ter = \frac{P \cdot L}{2 \cdot SE - 0.2P} + C$$ (ACCORDING TO PAR. PG-29.11)

MATERIAL	S (kPa)	E	L (mm)	C (mm)	teo (mm)	Q (mm)	te (mm)	ter (mm)		
SA515-60	117900	1.000	600.00	0.00	50.00	0.00	50.00	6.63		

VALUATION:
tf .GE. tfr…THICKNESS IS SUFFICIENT
te.GE.ter…THICKNESS IS SUFFICIENT



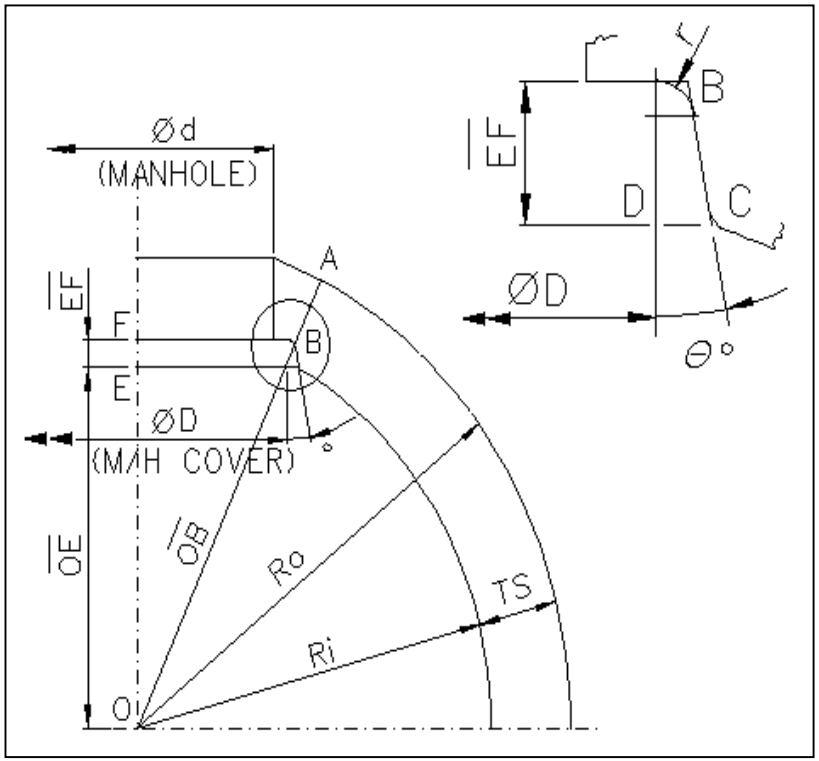
REINFORCEMENT CALCULATON (ACCORDING TO PAR. PG-33 AND PG-36)

THICKNESS OF WEAKEST CONCAVE COMPENSATION OF MANHOLE FULL HEMISPHERICAL HEAD

D (mm)	d (mm)	r (mm)	θ (DEG)	Ri (mm)	Ro (mm)	TS (mm)	TSR (mm)
500.00	450.00	6	10	600.00	650.00	50.00	6.63

TSR : MINIMUM REQUIRED THICKNESS OF HEAD

$\overline{EF}$(mm)	---	15.94
$\overline{CD}$(mm)	$\overline{EF}\cdot\tan\theta^\circ + r\cdot\tan[(90-\theta^\circ)/2)]$	7.85
$\overline{CE}$(mm)	$\overline{CD} + D/2$	257.85
$\overline{OE}$(mm)	$\sqrt{Ri^2 - \overline{CE}^2}$	541.77
$\overline{OF}$(mm)	$\overline{OE} + \overline{EF}$	557.71
$\overline{FB}$(mm)	$D/2 + r\cdot\tan[(90-\theta^\circ)/2)]$	255.03
$\overline{OB}$(mm)	$\sqrt{\overline{OF}^2 + \overline{FB}^2}$	613.26
$\overline{AB}$(mm)		36.74



VALUATION :

$\overline{AB}$ > TSR...MIN. THICKNESS IS SUFFICIENT

WORK NO.: PJT040602B WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0002B Rev.A

REINFORCEMENT CALCULATION (ACCORING TO PAR. PG-33 AND PG-36)

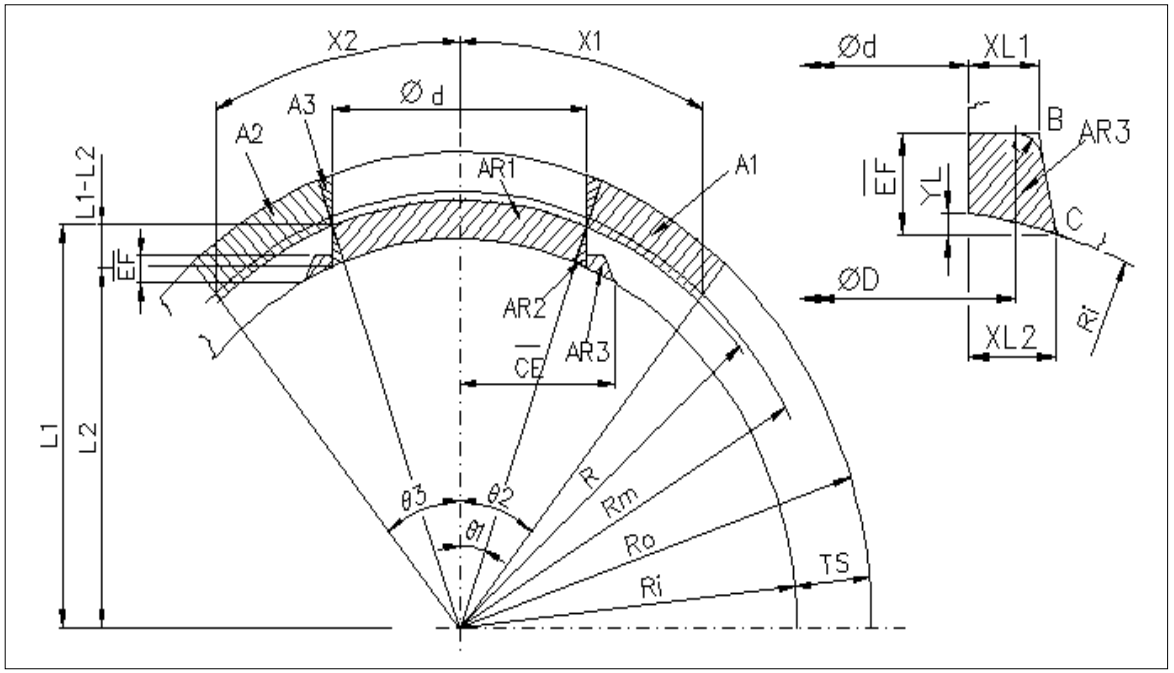
COMPENSATION OF MANHOLE FULL HEMISPHERICAL HEAD

HEAD PLATE			
MATERIAL	SA515-60	E	1.000
SS (kPa)	117900	y	0.400
Ri (mm)	600.00	C (mm)	0.00
TS (mm)	50.00	F	1.000
TSR (mm)	$\frac{P \cdot Ri}{2 \cdot SS \cdot E - 0.2 \cdot P} + C$		6.63
TSM (mm)	ExTS - FxTSR		43.37

MANHOLE PART					
D (mm)	M/H COVER	500.00	$\overline{EF}$ (mm)	-	15.94
d (mm)	M/H DIAMETER	450.00	YL (mm)	$L2 - \overline{OE}$	14.44
XL1 (mm)	$\overline{FB} - d/2$	30.03			
XL2 (mm)	$\overline{CE} - d/2$	32.85			
L1 (mm)	$\sqrt{R^2 - d^2/4}$	563.36			
L2 (mm)	$\sqrt{Ri^2 - d^2/4}$	556.21			

X1 (mm)	d	MAX.
	d/2 + TS	450.00
X2 (mm)	d	MAX.
	d/2 + TS	450.00

Ri (mm)	INSIDE RADIUS OF HEAD	600.00
R (mm)	Ri + TSR	606.63
Ro (mm)	Ri + TS	650.00
Rm (mm)	(Ri + Ro) / 2	625.00



REINGFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36)

COMB. NO. :N/A

θ1(DEG)	$\sin^{-1}\left(\frac{d/2}{R}\right)$	21.77	A1(mm²)	$\frac{\pi(\theta 2-\theta 1)}{360}\times(Ro^{2}-R^{2})$	9265
θ2(DEG)	$\frac{360\cdot X1}{2\pi Rm}$	41.25	A2(mm²)	$\frac{\pi(\theta 3-\theta 1)}{360}\times(Ro^{2}-R^{2})$	9265
θ3(DEG)	$\frac{360\cdot X2}{2\pi Rm}$	41.25	A3(mm²)	$(Ro-R)^{2}\times\tan\theta 1$	751
AR1(mm²)	$\frac{\pi\theta 1}{180}\left(R^{2}-Ri^{2}\right)$	3040.0	A0(mm²)	A1 + A2 + A3	19282
AR2(mm²)	$\sin\theta 1\cdot\cos\theta 1\cdot(L1-L2)^{2}$	18	---	---	---
AR3(mm²)	$(XL1+XL2)\times\overline{EF}-XL2\times YL$	528	---	---	---
AR(mm²)	AR1 + AR2 + AR3	3586	---	---	---

VALUATION : A0 ≥ AR …COMPENSATION IS SUFFICIENT

P=2600(kPa) TEMP.=229.0(^C)

HEAD PLATE

FLANGE

FORMULA $$tfr = \frac{P \cdot Di}{2SE - (1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

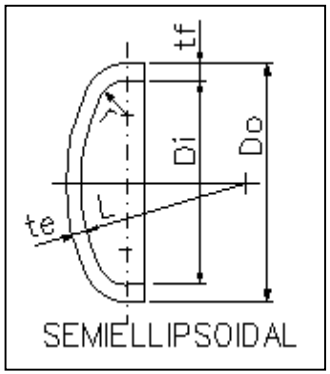
MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tfo (mm)	Q (mm)	tf (mm)	tfr (mm)
SA515-60	117900	1.000	0.400	0.00	1300.00	1200.00	50.00	0.00	50.00	13.41

THICKNESS CALCULATION OF HEAD PLATE

FORMULA $$ter = \frac{P \cdot Di}{2SE - (1-y)P} + C$$ (ACCORDING TO PAR. PG-29.7 AND PG-27.2.2)

MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	teo (mm)	Q (mm)	te (mm)	ter (mm)
SA515-60	117900	1.000	0.400	0.00	1300.00	1200.00	50.00	0.00	50.00	13.41

VALUATION:
tf .GE. tfr…THICKNESS IS SUFFICIENT
te.GE.ter…THICKNESS IS SUFFICIENT



SEMIELLIPSOIDAL HEAD

REQUIRED THICKNESS FOR CALCULATION OF REINFORCEMENT

$$tsr = \frac{0.9 \cdot P \cdot Di}{2 \cdot SE - 0.2P} + C$$

(ACCORDING TO PAR. PG-33.2.2)

C = 0.00(mm)

PARTICULAR	P (kPa)	TEMP (℃)	MATERIAL	S (kPa)	E	Di (mm)	ts (mm)	tsr (mm)
END PALTE (CPH OUTLET MANIFOLD(CC8))	2600	229.0	SA515-60	117900	1.0000	1200.00	50.00	11.93

REINFORCEMENT OF MANHOLE (ACCORDING TO PAR. PG-32)

VALUATION :

ts ≥ tsr … THICKNESS IS SUFFICIENT

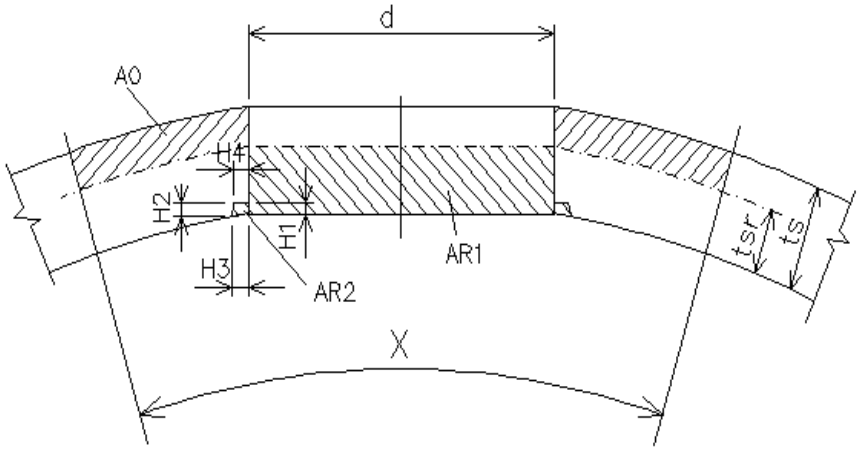
A0 ≥ AR … COMPENSATION IS SUFFICIENT

LIMIT OF REINFORCEMENT

X (mm)	2 · d	900.00

MANHOLE

d (mm)	H1 (mm)	H2 (mm)	H3 (mm)	H4 (mm)
450.00	1.50	7.94	31.43	25.00



AREA OF REINFORCEMENT REQUIRED

AR1 (mm²)	d · tsr	5371
AR2 (mm²)	1 / 2 · H3 · (H1 + H2) - 1 / 2 · H2 · (H3 - H4)	123
AR (mm²)	AR1 + AR2	5493

AREA OF REINFORCEMENT PROVIDED

A0 (mm²)	(ts - tsr) · (X - d)	17129

WORK NO.: PJT040602B WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0002B Rev.A

THICKNESS CALCULATION

HP 2ND SH INLET MANIFOLD(2HS1) P=10500(kPa) TEMP.=454.0(^C)

SHELL

FORMULA $tsr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

NAME	MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)	CHECK
HP 2ND SH INLET MANIFOLD(2HS1)	SA335-P22	114453	1.000	0.400	0.00	323.80	273.79	28.58	3.57	25.01	13.29	O

NOZZLE

FORMULAS (1) $tnr = \frac{PDo}{2SE + P} + 0.005Do + e$ (ACCORDING TO PAR. PG-27.2.1)

(2) $tnr = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

(3) $tnr = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

NOZZ NO.	NAME	FORMULA	MATERIAL	S (kPa)	E	y	e or C (mm)	Do (mm)	Di (mm)	tno (mm)	Q (mm)	tn (mm)	tnr (mm)	CHECK
1	HP 2ND SH INLET MANIFOLD NOZZLE1(2HS1)	(3)	SA335-P22	114453	1.000	0.400	0.00	168.30	136.35	18.26	2.28	15.98	6.62	O
2	HP 2ND SH INLET MANIFOLD DRIP LEG(2HS1)	(3)	SA335-P22	114453	1.000	0.400	0.00	219.10	178.83	23.01	2.88	20.13	8.68	O

MAXIMUM DIAMETER OF OPENINGS WHICH

DO NOT REQUIRE COMPENSATION P=10500(kPa) TEMP.=454.0(^C)

FORMULAS

$$Drf = MAX.(D1, D2)$$

$$D1 = MIN.(203.2\,mm, 8.084 \cdot \sqrt[3]{Do \cdot ts(1-K)})$$ (ACCORDING TO PAR. PG-32.1.2)

$$K = MIN.(0.99, \frac{PDo}{182\,S \cdot ts})$$

$$D2 = MIN.(50.8\,mm, Di/4)$$ (ACCORDING TO PAR. PG-32.1.3.1)

CONDITION $Do \cdot ts = MAX.\ 387096\ mm^2$

MATERIAL	S (kPa)	Do (mm)	Di (mm)	ts (mm)	K	Do·ts (mm²)	Di / 4 (mm)	D1 (mm)	D2 (mm)	Drf (mm)
SA335-P22	114453	323.80	273.79	25.01	0.653	8097	68.45	114.11	50.80	114.11

WORK NO.: PJT040602B WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0002B Rev.A

EQUIVALENT DIAMETER OF HOLES

SHELL P=10500(kPa) TEMP.=454.0(^C)

NAME	MATERIAL	Ss (kPa)	Dos (mm)	tso (mm)	Drf (mm)
HP 2ND SH INLET MANIFOLD(2HS1)	SA335-P22	114453	323.80	28.58	114.11

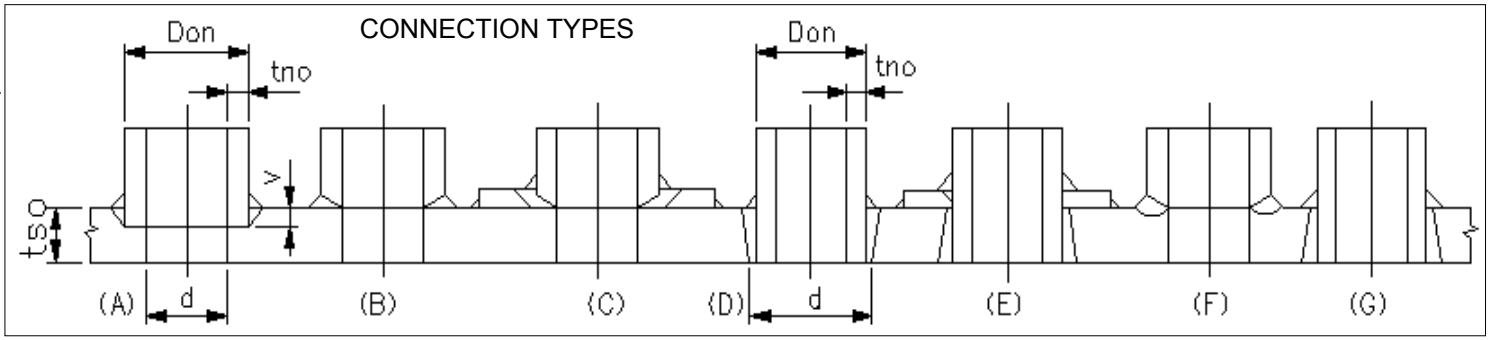
NOZZLE

$$de = \frac{ds \cdot v + d(tso - v)}{tso}$$

$$ds = Don - 2 \cdot tno \cdot K$$

$$K = MIN.(1.00, \frac{Sn}{Ss})$$

CONNECTION TYPES



VALUATIOIN

d.GT.Drf ... REINFORCEMENT

NOZZ. NO.	NAME	CONN. TYPE	MATERIAL	Sn (kPa)	Don (mm)	tno (mm)	d (mm)	v (mm)	ds (mm)	de (mm)	REINFOR. CALCUL.
1	HP 2ND SH INLET MANIFOLD NOZZLE1(2HS1)	(B)	SA335-P22	114453	168.30	18.26	136.00	---	---	136.00	YES
2	HP 2ND SH INLET MANIFOLD DRIP LEG(2HS1)	(B)	SA335-P22	114453	219.10	23.01	179.00	---	---	179.00	YES

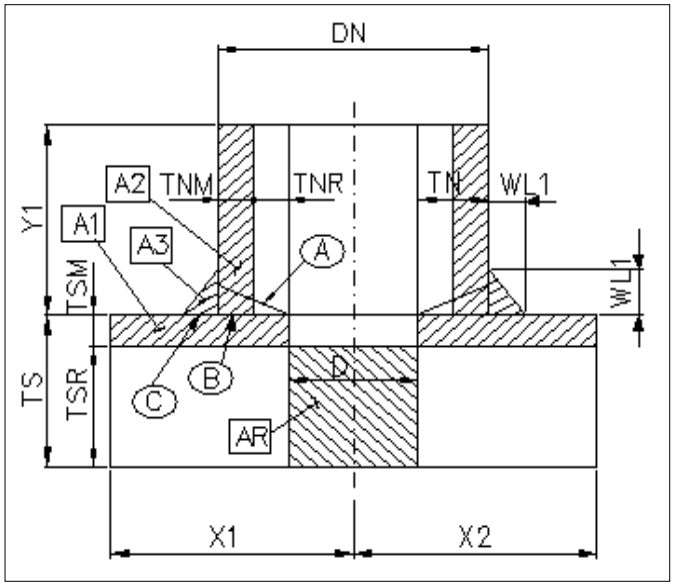
WORK NO.: PJT040602B WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0002B Rev.A

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36) TYPE(K-1)

COMB. NO. : N/A NOZZLE NO. :1 HP 2ND SH INLET MANIFOLD NOZZLE1(2HS1) P=10500(kPa) TEMP.=454.0(^C)

SHELL				NOZZLE			
MATERIAL	SA335-P22	E	1.000	MATERIAL	SA335-P22	E	1.000
SS(kPa)	114453	y	0.400	SN(kPa)	114453	D(mm)	136.00
DS(mm)	323.80	C(mm)	0.00	DN(mm)	168.30	WL1(mm)	9.00
Dis(mm)	273.79	F	1.000	Din(mm)	136.35		
TS(mm)	25.01			TN(mm)	15.98		
TSR(mm)	$\frac{PDis}{2\cdot SS\cdot E-2(1-y)P}+C$		13.29	TNR(mm)	$\frac{PDin}{2\cdot SN\cdot E-2(1-y)P}$		6.62
TSM(mm)	ExTS-FxTSR		11.72	TNM(mm)	TN-TNR		9.36

X1=X2 (mm)	D	MAX.
	D/2+(TS+TN)	136.00
Y1 (mm)	2.5xTS	MIN.
	2.5xTN	39.94



WORK NO.: PJT040602B WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0002B Rev.A

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36)

COMB. NO. : N/A NOZZLE NO. :1 HP 2ND SH INLET MANIFOLD NOZZLE1(2HS1)

			LARGE OPENINGS (ACCORDING TO PAR. PG-32.3.2 AND PG-32.3.3)		
AR (mm²)	D x TSR x F	1807	AJR (mm²)	---	---
A1 (mm²)	(X1 + X2 - D) x TSM	1594	AJ1 (mm²)	---	---
A2 (mm²)	2 x Y1 x TNM x SN/SS	748	AJ2 (mm²)	---	---
A3 (mm²)	WL1 x WL1	81	AJ3 (mm²)	---	---
A4 (mm²)	---	---	AJ4 (mm²)	---	---
A0 (mm²)	A1 + A2 + A3	2422	AJ0 (mm²)	---	---
VALUATION:	AO ≥ AR …REINFORCEMENT IS SUFFICIENT		VALUATION:	AJ0 ≥ AJR …REINFORCEMENT IS SUFFICIENT	

STRENGTH CALCULATIONS OF WELDS ARE NOT REQUIRED (ACCORDING TO PAR.PW-15.1.6)

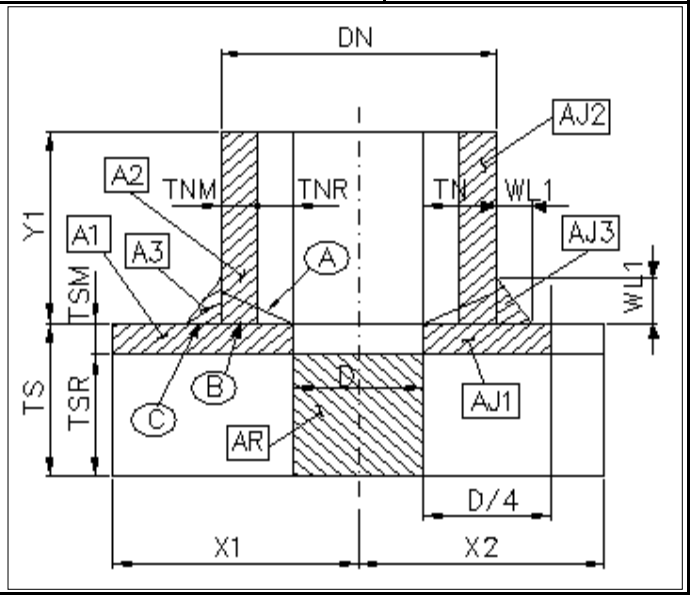
WORK NO.: PJT040602B WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0002B Rev.A

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36) TYPE(K-4)

COMB. NO. : N/A NOZZLE NO. :2 HP 2ND SH INLET MANIFOLD DRIP LEG(2HS1) P=10500(kPa) TEMP.=454.0(^C)

SHELL				NOZZLE			
MATERIAL	SA335-P22	E	1.000	MATERIAL	SA335-P22	E	1.000
SS(kPa)	114453	y	0.400	SN(kPa)	114453	D(mm)	179.00
DS(mm)	323.80	C(mm)	0.00	DN(mm)	219.10	WL1(mm)	9.00
Dis(mm)	273.79	F	1.000	Din(mm)	178.83		
TS(mm)	25.01			TN(mm)	20.13		
TSR(mm)	$\frac{PDis}{2\cdot SS\cdot E-2(1-y)P}+C$		13.29	TNR(mm)	$\frac{PDin}{2\cdot SN\cdot E-2(1-y)P}$		8.68
TSM(mm)	ExTS-FxTSR		11.72	TNM(mm)	TN-TNR		11.45

X1=X2 (mm)	D	MAX.
	D/2+(TS+TN)	179.00
Y1 (mm)	2.5xTS	MIN.
	2.5xTN	50.33



REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36)

COMB. NO. : N/A NOZZLE NO. :2 HP 2ND SH INLET MANIFOLD DRIP LEG(2HS1)

			LARGE OPENINGS (ACCORDING TO PAR. PG-32.3.2 AND PG-32.3.3)		
AR (mm²)	D x TSR x F	2379	AJR (mm²)	2/3 x AR	1586
A1 (mm²)	(X1 + X2 - D) x TSM	2097	AJ1 (mm²)	D/2 x TSM	1049
A2 (mm²)	2 x Y1 x TNM x SN/SS	1153	AJ2 (mm²)	2 x Y1 x TNM x SN/SS	1153
A3 (mm²)	WL1 x WL1	81	AJ3 (mm²)	WL1 x WL1	81
A4 (mm²)	---	---	AJ4 (mm²)	---	---
A0 (mm²)	A1 + A2 + A3	3331	AJ0 (mm²)	AJ1 + AJ2 + AJ3	2283
VALUATION:	AO ≥ AR …REINFORCEMENT IS SUFFICIENT		VALUATION:	AJ0 ≥ AJR …REINFORCEMENT IS SUFFICIENT	

STRENGTH CALCULATIONS OF WELDS ARE NOT REQUIRED (ACCORDING TO PAR.PW-15.1.6)

MIN. REQUIRED THICKNESS

THICKNESS CALCULATION

FORMULAS

(1) $t = \frac{PDo}{2SE + P} + 0.005Do + e$ (ACCORDING TO PAR. PG-27.2.1)

(2) $t = \frac{PDo}{2SE + 2yP} + C$ (ACCORDING TO PAR. PG-27.2.2)

(3) $t = \frac{PDi}{2SE - 2(1-y)P} + C$ (ACCORDING TO PAR. PG-27.2.2)

NO.	NAME	FORMULA	P (kPa)	TEMP (℃)	MATL	S (kPa)	E	y	e or C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	t (mm)	CHECK
1	HP 2ND SH INLET PIPE(2HS2)	(3)	10500	454.0	SA335-P22	114453	1.000	0.400	0.00	168.30	149.10	10.97	1.37	9.60	7.24	O
2	HP 2ND SH OUTLET PIPE(2HS6)	(3)	10500	528.0	SA335-P22	61953	1.000	0.640	0.00	219.10	183.02	20.62	2.58	18.04	16.52	O

WORK NO.: PJT040602B WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0002B Rev.A

THICKNESS CALCULATION

HP 2ND SH OUTLET MANIFOLD(2HS7) P=10500(kPa) TEMP.=528.0(^C)

SHELL

FORMULA $$tsr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NAME	MATERIAL	S (kPa)	E	y	C (mm)	Do (mm)	Di (mm)	tso (mm)	Q (mm)	ts (mm)	tsr (mm)	CHECK
HP 2ND SH OUTLET MANIFOLD(2HS7)	SA335-P22	61953	1.000	0.640	0.00	323.80	253.80	40.00	5.00	35.00	22.90	O

NOZZLE

FORMULAS

(1) $$tnr = \frac{PDo}{2SE + P} + 0.005Do + e$$ (ACCORDING TO PAR. PG-27.2.1)

(2) $$tnr = \frac{PDo}{2SE + 2yP} + C$$ (ACCORDING TO PAR. PG-27.2.2)

(3) $$tnr = \frac{PDi}{2SE - 2(1-y)P} + C$$ (ACCORDING TO PAR. PG-27.2.2)

NOZZ NO.	NAME	FORMULA	MATERIAL	S (kPa)	E	y	e or C (mm)	Do (mm)	Di (mm)	tno (mm)	Q (mm)	tn (mm)	tnr (mm)	CHECK
1	HP 2ND SH OUTLET MANIFOLD NOZZLE1(2HS7)	(3)	SA335-P22	61953	1.000	0.640	0.00	219.10	166.60	30.00	3.75	26.25	15.03	O
2	HP 2ND SH OUTLET MANIFOLD NOZZLE2(2HS7)	(3)	SA335-P22	61953	1.000	0.640	0.00	323.80	253.80	40.00	5.00	35.00	22.90	O

MAXIMUM DIAMETER OF OPENINGS WHICH

DO NOT REQUIRE COMPENSATION P=10500(kPa) TEMP.=528.0(^C)

FORMULAS

$$Drf = MAX.(D1, D2)$$

$$D1 = MIN.(203.2\,mm, 8.084 \cdot \sqrt[3]{Do \cdot ts(1-K)})$$ (ACCORDING TO PAR. PG-32.1.2)

$$K = MIN.(0.99, \frac{PDo}{182\,S \cdot ts})$$

$$D2 = MIN.(50.8\,mm, Di/4)$$ (ACCORDING TO PAR. PG-32.1.3.1)

CONDITION $Do \cdot ts = MAX.\ 387096\ mm^2$

MATERIAL	S (kPa)	Do (mm)	Di (mm)	ts (mm)	K	Do·ts (mm²)	Di / 4 (mm)	D1 (mm)	D2 (mm)	Drf (mm)
SA335-P22	61953	323.80	253.80	35.00	0.862	11333	63.45	93.95	50.80	93.95

EQUIVALENT DIAMETER OF HOLES

SHELL P=10500(kPa) TEMP.=528.0(^C)

NAME	MATERIAL	Ss (kPa)	Dos (mm)	tso (mm)	Drf (mm)
HP 2ND SH OUTLET MANIFOLD(2HS7)	SA335-P22	61953	323.80	40.00	93.95

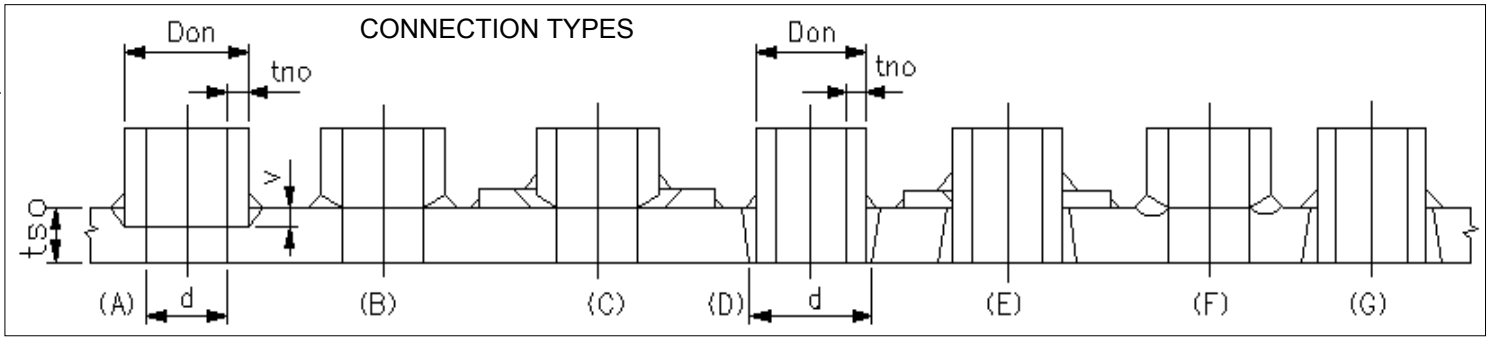
NOZZLE

$$de = \frac{ds \cdot v + d(tso - v)}{tso}$$

$$ds = Don - 2 \cdot tno \cdot K$$

$$K = MIN.(1.00, \frac{Sn}{Ss})$$

CONNECTION TYPES



VALUATIOIN

d.GT.Drf ... REINFORCEMENT

NOZZ. NO.	NAME	CONN. TYPE	MATERIAL	Sn (kPa)	Don (mm)	tno (mm)	d (mm)	v (mm)	ds (mm)	de (mm)	REINFOR. CALCUL.
1	HP 2ND SH OUTLET MANIFOLD NOZZLE1(2HS7)	(B)	SA335-P22	61953	219.10	30.00	167.00	---	---	167.00	YES
2	HP 2ND SH OUTLET MANIFOLD NOZZLE2(2HS7)	(B)	SA335-P22	61953	323.80	40.00	254.00	---	---	254.00	YES
2	HP 2ND SH OUTLET MANIFOLD NOZZLE2(2HS7)	(D)	SA335-P22	61953	323.80	40.00	326.00	---	---	326.00	YES
2	HP 2ND SH OUTLET MANIFOLD NOZZLE2(2HS7)	(D)	SA335-P22	61953	323.80	40.00	326.00	---	---	326.00	YES

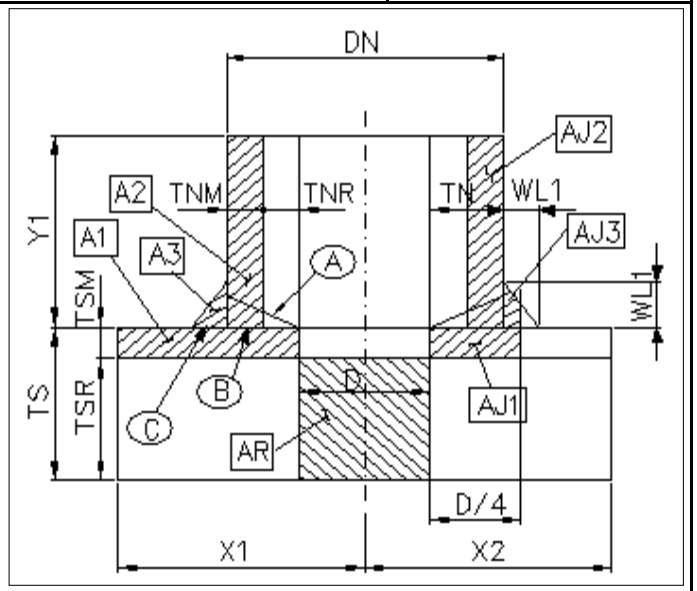
WORK NO.: PJT040602B WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0002B Rev.A

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36) TYPE(K-4B)

COMB. NO. : N/A NOZZLE NO. :1 HP 2ND SH OUTLET MANIFOLD NOZZLE1(2HS7) P=10500(kPa) TEMP.=528.0(^C)

SHELL				NOZZLE			
MATERIAL	SA335-P22	E	1.000	MATERIAL	SA335-P22	E	1.000
SS(kPa)	61953	y	0.640	SN(kPa)	61953	D(mm)	167.00
DS(mm)	323.80	C(mm)	0.00	DN(mm)	219.10	WL1(mm)	25.00
Dis(mm)	253.80	F	1.000	Din(mm)	166.60		
TS(mm)	35.00			TN(mm)	26.25		
TSR(mm)	$\frac{PDis}{2\cdot SS\cdot E-2(1-y)P}+C$		22.90	TNR(mm)	$\frac{PDin}{2\cdot SN\cdot E-2(1-y)P}$		15.03
TSM(mm)	ExTS-FxTSR		12.10	TNM(mm)	TN-TNR		11.22

X1=X2 (mm)	D	MAX.
	D/2+(TS+TN)	167.00
Y1(mm)	2.5xTS	MIN.
	2.5xTN	65.63



REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36)

COMB. NO. : N/A NOZZLE NO. :1 HP 2ND SH OUTLET MANIFOLD NOZZLE1(2HS7)

			LARGE OPENINGS (ACCORDING TO PAR. PG-32.3.2 AND PG-32.3.3)		
AR (mm²)	D x TSR x F	3825	AJR (mm²)	2/3 x AR	2550
A1 (mm²)	(X1 + X2 - D) x TSM	2020	AJ1 (mm²)	D/2 x TSM	1010
A2 (mm²)	2 x Y1 x TNM x SN/SS	1472	AJ2 (mm²)	2 x Y1 x TNM x SN/SS	1472
A3 (mm²)	WL1 x WL1	625	AJ3 (mm²)	$WL1^2 - 1/4 \times (DN + 2 \times WL1 - 3/2 \times D)^2$	539
A4 (mm²)	---	---	AJ4 (mm²)	---	---
A0 (mm²)	A1 + A2 + A3	4117	AJ0 (mm²)	AJ1 + AJ2 + AJ3	3021
VALUATION:	AO ≥ AR …REINFORCEMENT IS SUFFICIENT		VALUATION:	AJ0 ≥ AJR …REINFORCEMENT IS SUFFICIENT	

STRENGTH CALCULATIONS OF WELDS ARE NOT REQUIRED (ACCORDING TO PAR.PW-15.1.6)

WORK NO.: PJT040602B WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0002B Rev.A

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36) TYPE(S-2)

COMB. NO. : N/A NOZZLE NO. :2 HP 2ND SH OUTLET MANIFOLD NOZZLE2(2HS7) P=10500(kPa) TEMP.=528.0(^C)

SHELL				NOZZLE			
MATERIAL	SA335-P22	E	1.000	MATERIAL	SA335-P22	E	1.000
SS(kPa)	61953	y	0.640	SN(kPa)	61953	D(mm)	253.80
DS(mm)	323.80	C(mm)	0.00	DN(mm)	323.80	D1(mm)	326.00
Dis(mm)	253.80	F	1.000	Din(mm)	253.80	WL1(mm)	10.00
TS(mm)	35.00			TN(mm)	35.00		
TSR(mm)	$\frac{PDis}{2 \cdot SS \cdot E - 2(1-y)P} + C$		22.90	TNR(mm)	$\frac{PDin}{2 \cdot SN \cdot E - 2(1-y)P}$		22.90
TSM(mm)	ExTS-FxTSR		12.10	TNM(mm)	TN-TNR		12.10

X1=X2 (mm)	D	MAX.
	D/2+(TS+TN)	253.80
Y1(mm)	2.5xTS	MIN.
	2.5xTN	87.50

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36)

COMB. NO. : N/A NOZZLE NO. :2 HP 2ND SH OUTLET MANIFOLD NOZZLE2(2HS7)

			LARGE OPENINGS (ACCORDING TO PAR. PG-32.3.2 AND PG-32.3.3)		
AR (mm²)	D x TSR x F	5813	AJR (mm²)	2/3 x AR	3875
A1 (mm²)	(X1 + X2 - D) x TSM - (DN - D)x TS x (1 - SN/SS)	3070	AJ1 (mm²)	D/2 x TSM x TSM - (DN - D) x TS x (1 - SN/SS)	1535
A2 (mm²)	2 x Y1 x TNM x SN/SS	2117	AJ2 (mm²)	2 x Y1 x TNM x SN/SS	2117
A3 (mm²)	WL1 x WL1	100	AJ3 (mm²)	WL1 x WL1	100
A4 (mm²)	---	---	AJ4 (mm²)	---	---
A0 (mm²)	A1 + A2 + A3	5287	AJ0 (mm²)	AJ1 + AJ2 + AJ3	3752
VALUATION:	>>>CHECK!!<<<		VALUATION:	>>>CHECK!!<<<	

STRENGTH CALCULATIONS OF WELDS ARE NOT REQUIRED (ACCORDING TO PAR.PW-15.1.6)

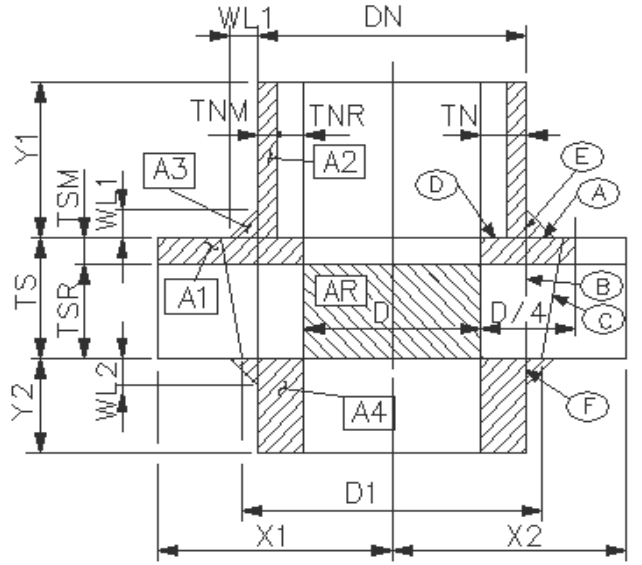
WORK NO.: PJT040602B WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0002B Rev.A

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36) TYPE(S-21)

COMB. NO. : N/A NOZZLE NO. :2 HP 2ND SH OUTLET MANIFOLD NOZZLE2(2HS7) P=10500(kPa) TEMP.=528.0(^C)

SHELL				NOZZLE			
MATERIAL	SA335-P22	E	1.000	MATERIAL	SA335-P22	E	1.000
SS(kPa)	61953	y	0.640	SN(kPa)	61953	D(mm)	253.80
DS(mm)	323.80	C(mm)	0.00	DN(mm)	323.80	D1(mm)	326.00
Dis(mm)	253.80	F	1.000	Din(mm)	253.80	WL1(mm)	10.00
TS(mm)	35.00			TN(mm)	35.00	WL2(mm)	10.00
TSR(mm)	$\frac{PDis}{2 \cdot SS \cdot E - 2(1-y)P} + C$		22.90	TNR(mm)	$\frac{PDin}{2 \cdot SN \cdot E - 2(1-y)P}$		22.90
TSM(mm)	E x TS - F x TSR		12.10	TNM(mm)	TN - TNR		12.10

X1=X2 (mm)	D		MAX.
	D / 2 + (TS + TN)		253.80
Y1(mm)	2.5 x TS		MIN.
	2.5 x TN		87.50
Y2(mm)	2.5 x TS	MIN.	MIN.
	2.5 x TN	87.50	
	20.00		20.00



REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36)

COMB. NO. : N/A NOZZLE NO. :2 HP 2ND SH OUTLET MANIFOLD NOZZLE2(2HS7)

			LARGE OPENINGS (ACCORDING TO PAR. PG-32.3.2 AND PG-32.3.3)		
AR (mm²)	D x TSR x F	5813	AJR (mm²)	2/3 x AR	3875
A1 (mm²)	(X1 + X2-D) x TSM-(DN-D)x TS x(1-SN/SS)	3070	AJ1 (mm²)	D/2 x TSM x TSM-(DN-D)x TS x(1-SN/SS)	1535
A2 (mm²)	2 x Y1 x TNM x SN/SS	2117	AJ2 (mm²)	2 x Y1 x TNM x SN/SS	2117
A3 (mm²)	WL1 x WL1 + WL2 x WL2	200	AJ3 (mm²)	WL1 x WL1 + WL2 x WL2	200
A4 (mm²)	2 x Y2 x TN x SN/SS	1400	AJ4 (mm²)	2 x Y2 x TN x SN/SS	1400
A0 (mm²)	A1 + A2 + A3 + A4	6787	AJ0 (mm²)	AJ1 + AJ2 + AJ3 + AJ4	5252
VALUATION:	AO ≥ AR …REINFORCEMENT IS SUFFICIENT		VALUATION:	AJ0 ≥ AJR …REINFORCEMENT IS SUFFICIENT	

STRENGTH CALCULATIONS OF WELDS ARE NOT REQUIRED (ACCORDING TO PAR.PW-15.1.6)

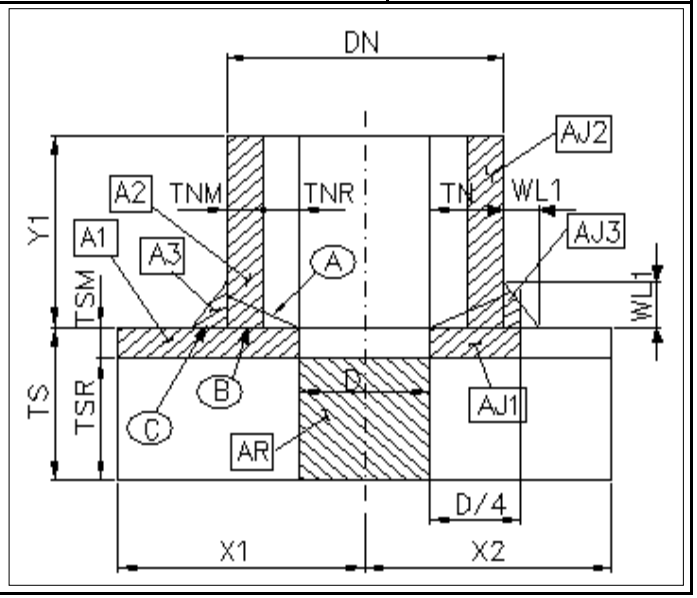
WORK NO.: PJT040602B WORK NAME: PILOT PROJECT FOR PR DOC.NO.: DOC0002B Rev.A

REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36) TYPE(K-4B)

COMB. NO. : N/A NOZZLE NO. :2 HP 2ND SH OUTLET MANIFOLD NOZZLE2(2HS7) P=10500(kPa) TEMP.=528.0(^C)

SHELL				NOZZLE			
MATERIAL	SA335-P22	E	1.000	MATERIAL	SA335-P22	E	1.000
SS(kPa)	61953	y	0.640	SN(kPa)	61953	D(mm)	254.00
DS(mm)	323.80	C(mm)	0.00	DN(mm)	323.80	WL1(mm)	30.00
Dis(mm)	253.80	F	1.000	Din(mm)	253.80		
TS(mm)	35.00			TN(mm)	35.00		
TSR(mm)	$\frac{PDis}{2 \cdot SS \cdot E - 2(1-y)P} + C$		22.90	TNR(mm)	$\frac{PDin}{2 \cdot SN \cdot E - 2(1-y)P}$		22.90
TSM(mm)	ExTS-FxTSR		12.10	TNM(mm)	TN-TNR		12.10

X1=X2 (mm)	D	MAX.
	D/2+(TS+TN)	254.00
Y1(mm)	2.5xTS	MIN.
	2.5xTN	87.50



REINFORCEMENT CALCULATION (ACCORDING TO PAR. PG-33 AND PG-36)

COMB. NO. : N/A NOZZLE NO. :2 HP 2ND SH OUTLET MANIFOLD NOZZLE2(2HS7)

			LARGE OPENINGS (ACCORDING TO PAR. PG-32.3.2 AND PG-32.3.3)		
AR (mm²)	D x TSR x F	5817	AJR (mm²)	2/3 x AR	3878
A1 (mm²)	(X1 + X2 - D) x TSM	3073	AJ1 (mm²)	D/2 x TSM	1536
A2 (mm²)	2 x Y1 x TNM x SN/SS	2117	AJ2 (mm²)	2 x Y1 x TNM x SN/SS	2117
A3 (mm²)	WL1 x WL1	900	AJ3 (mm²)	$WL1^2 - 1/4 \times (DN + 2 \times WL1 - 3/2 \times D)^2$	898
A4 (mm²)	---	---	AJ4 (mm²)	---	---
A0 (mm²)	A1 + A2 + A3	6090	AJ0 (mm²)	AJ1 + AJ2 + AJ3	4551
VALUATION:	AO ≥ AR …REINFORCEMENT IS SUFFICIENT		VALUATION:	AJ0 ≥ AJR …REINFORCEMENT IS SUFFICIENT	

STRENGTH CALCULATIONS OF WELDS ARE NOT REQUIRED (ACCORDING TO PAR.PW-15.1.6)

THICKNESS CALCULATION OF MANHOLE COVER

FORMULA $ter = dm \cdot \sqrt{\frac{CP}{S}}$ (ACCORDING TO PAR. PG-31.3.2)

$dm = \frac{d1 + d2}{2}$

NO.	NAME	P (kPa)	TEMP (℃)	MATL	S (kPa)	C PG-31(j)	d1 (mm)	d2 (mm)	dm (mm)	te (mm)	ter (mm)	CHECK
1	COVER PLATE(CPH OUTLET MANIFOLD(CC8))	2600	229.0	A105	136676	0.300	450.00	500.00	475.00	50.00	35.88	O
2	COVER PLATE(CPH OUTLET MANIFOLD(CC8))	2600	229.0	A105	136676	0.300	450.00	500.00	475.00	50.00	35.88	O

VALUATION:
ter.GE.te…THICKNESS IS SUFFICIENT