ASME SEC. VIII DIV.1 STRENGTH CALCULATION

CYLINDERICAL SHELL THICKNESS FOR INT/EXT & NOZZLE LOAD

INPUT DATA 계산실행 ***V5.0***

* DESCRIPTION	PES21		* ITEM NO.	E-1004	
DESIGN DATA					
* INTERNAL DESIGN PRESSURE,P	3.5	Kg/cm^2	* EXTERNAL DESIGN PRESSURE	1.05	Kg/cm^2
* LIQUID HEAD,H1 @ HYDRO TEST	3000	mm	* SPEIFIC GRAVITY OF FLUID @ OPERATING	960	Kg/m^3
* LIQUID HEAD,H2 @ OPERATING	2000	mm			
* INSIDE RADIUS (CORRODED)	1503	mm	* JOINT EFFICIENCY,E	1.0	
* CORROSION ALLOWANCE,C	3	mm	* DESIGN TEMPERATURE	300	°F
* MATERIAL	A516-70		* DESIGN LENGTH FOR EXTERNAL PRESSURE CHECK	2438	mm
* SHELL USED THICKNESS	13	mm	* NOZZLE SIZE ATTACHING IN SHELL	3"(DN75)	
* NOZZLE THICKNESS, tn	13	mm	* FLANGE RATING	150#	
* REINFORCING PAD RADIUS, ro	203.2	mm	* REINFORCING PAD THICKNESS, tp	13	

RESULT OF CALCULATION

RESULT OF THICKNESS CALCULATION

* Used thickness check for internal pressure	O.K		* Used thickness check for external pressure	O.K	
			* Used thickness check for nozzle load & local stress	O.K	

1. THICKNESS FOR INTERNAL PRESSURE

[A] Per UG-27 (C)(1) CIRCUMFERENTIAL STRESS (LONG.SEAM)

* Allowable stress @ Design Temp.	1,406.1	Kg/cm^2			
* Allowable stress @ Room Temp	1,406.1	Kg/cm^2	* Circumferential stress, P < 0.385 SE =	541.4	Kg/cm^2
* Min. required thickness ; t1 = PR/(SE-0.6P)	3.95	mm	* Stress check	O.K	

[B] Per UG-27 (C)(2) LONGITUDINAL STRESS (CIRCUM.SEAM)

* Circumferential stress, P < 1.25 SE =	1,757.7	Kg/cm^2			
* Min. required thickness ; t2 = PR/(2SE+0.4P)	1.97	mm	* Stress check	O.K	

[C] MINIMUM DESIGN TH'K

* Shell Min. required Thickness, t = The larger of t1 or t2 or t3 + C	4.60	mm	* Shell Mininum thickness as per UG-16(b), t3+C	4.60	mm
* MAWP(HOT&CORRODED) =SEt-C/R+0.6t-C-H1	9.0	Kg/cm^2	** MAWP(NEW&COLD) =SEt/R+0.6t-H1	11.8	Kg/cm^2

2. THICKNESS FOR EXTERNAL PRESSURE

* The ratio of outside dia./Shell thickness, Ratio1	302.6		* Modulus Elasticity	2,038,903	Kg/cm^2
* The ratio of design length /outside dia., Ratio2	0.806		* Factor "A"	0.0002725	
* Max. allowable external pressure,(4*Factor "B")/(3*Ratio1)	1.194	Kg/cm^2	* Factor "B"	271	

3. NOZZLE NOAD CALCULATION

* Radial Nozzle Force, P	367.2	Kg	* Circumferential Moment, MC	55.1	Kg-m
			* Longitudinal Moment, ML	71.4	Kg-m
* Gamma (λ) = Rm / T, (T=Ts-CA)	65.35		* Beta(β) =0.875*ro / Rm =	0.118	

2. RESULT OF X-STRESS CALCULATION, Kg/cm^2

Applicable Formulars	FIG NO	Curve Value	Au	AL	Bu	BL	Cu	CL	Du	DL
Local Membrane(p) =Kn*{Nφ/(P/Rm)}*(P/Rm*T)	3C	6.8	-	-	-	-	-7.2	-7.2	-7.2	-7.2
Local Membrane(P) =Kn*{Nφ/(P/Rm)}*(P/Rm*T)	4C	12.5	-13.3	-13.3	-13.3	-13.3	-	-	-	-
Bending(P)=Kb*{Mφ/P}*	1C	0.055	-	-	-	-	-22.9	22.9	-22.9	22.9

(6*P/T^2)										
Bending(P)=Kb*{Mφ/P}*(6*P/T^2)	2C-1	0.08	-33.3	33.3	-33.3	33.3	-	-	-	-
Local Membrane(Mc)=Kn*{Mφ/(Mc/Rm^2β)}*(Mc/Rm^2βT)	3A	2.3	-	-	-	-	-20.6	-20.6	20.6	20.6
Bending(Mc)=Kb*{Mφ/(Mc/Rmβ)}*(6*Mc/RmβT^2)	1A	0.087	-	-	-	-	-305.7	305.7	305.7	-305.7
Local Membrane(ML)=Kn*{Mφ/(ML/Rm^2β)}*(ML/Rm^2βT)	3B	7.568	-87.9	-87.9	87.9	87.9	-	-	-	-
Bending(ML)=Kb*{Mφ/(ML/Rmβ)}*(6*ML/RmβT^2)	1B-1	0.024	-109.3	109.3	109.3	-109.3	-	-	-	-
Membrane(Pd)=Pd*Rm/T			12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5
Add algebraically for summation of σφ (Circumferential)			-231.3	54.0	163.2	11.2	-343.9	313.3	308.7	-256.8
Calculated Membrane Stress, mx			-88.6		87.2		-15.3		25.9	

3. RESULT OF Y-STRESS CALCULATION, Kg/cm^2

Applicable Formulars	FIG NO	Curve Value	Au	AL	Bu	BL	Cu	CL	Du	DL
Local Membrane(P)=Kn*{NΨ/(P/Rm)}*(P/Rm*T)	3C	6.8	-7.2	-7.2	-7.2	-7.2	-	-	-	-
Local Membrane(P)=Kn*{NΨ/(P/Rm)}*(P/Rm*T)	4C	12.5	-	-	-	-	-13.3	-13.3	-13.3	-13.3
Bending(P)=Kb*{MΨ/P}*(6*P/T^2)	1C-1	0.1	-41.6	41.6	-41.6	41.6	-	-	-	-
Bending(P)=Kb*{MΨ/P}*(6*P/T^2)	2C	0.071	-	-	-	-	-29.6	29.6	-29.6	29.6
Local Membrane(Mc)=Kn*{MΨ/(Mc/Rm^2β)}*(Mc/Rm^2βT)	4A	4.215	-	-	-	-	-37.8	-37.8	37.8	37.8
Bending(Mc)=Kb*{MΨ/(Mc/Rmβ)}*(6*Mc/RmβT^2)	2A	0.0436	-	-	-	-	-153.2	153.2	153.2	-153.2
Local Membrane(ML)=Kn*{MΨ/(ML/Rm^2β)}*(ML/Rm^2βT)	4B	2.526	-29.3	-29.3	29.3	29.3	-	-	-	-
Bending(ML)=Kb*{MΨ/(ML/Rmβ)}*(6*ML/RmβT^2)	2B-1	0.030	-136.6	136.6	136.6	-136.6	-	-	-	-
Membrane(Pd)=Pd*Rm/(2*T)			6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Add algebraically for summation of σΨ (Longitudinal)			-208.6	148.0	123.4	-66.6	-227.5	138.0	154.4	-92.9
Calculated Membrane Stress, my			-30.3		28.4		-44.8		30.8	
Shear stress due to Torsion, Mt	Mt / (2 *π * ro ^ 2 * T)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shear stress due to Torsion, Vc	Vc / (2 *π * ro * T)		0.0	0.0	0.0	0.0	-	-	-	-
Shear stress due to Torsion, VL	VL / (2 *π * ro * T)		-	-	-	-	0.0	0.0	0.0	0.0
Add algebraically for summation of Shear Stress, τφΨ			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

MEMBRANE + BENDING STRESS INTENSITIES AT THE NOTED LOCATION, When τ ≠ 0, S= The largest absolute value of either, 0.5{(σΨ+σφ)±√(σΨ+σφ)^2+4τφΨ^2} or √(σΨ+σφ)^2+4τφΨ^2	208.6	148.0	163.2	11.2	227.5	313.3	308.7	92.9
	231.3	54.0	123.4	66.6	343.9	138.0	154.4	256.8
	22.7	94.0	39.8	77.8	116.3	175.3	154.3	164.0
MAX. COMBINED STRESS INTENSITY, Primary(Pm+PL), Smax =	231.3	148.0	163.2	77.8	343.9	313.3	308.7	256.8
Allowable Stress, Smax = 3*Sm	4,218.4	4,218.4	4,218.4	4,218.4	4,218.4	4,218.4	4,218.4	4,218.4
Judgement	O.K	O.K	O.K	O.K	O.K	O.K	O.K	O.K
MEMBRANE INTENSITIES AT THE NOTED LOCATION, When τ ≠ 0, S= The largest absolute value of either, 0.5{(my+mx)±√(my+mx)^2+4τφΨ^2} or √(my+mx)^2+4τφΨ^2	30.3	30.3	87.2	87.2	15.3	15.3	30.8	30.8
	177.8	0.5	75.9	19.1	136.2	46.6	87.7	35.9
	58.4	58.4	58.8	58.8	29.5	29.5	4.8	4.8
MAX. MEMBRANE STRESS INTENSITY, Primary+Secondary), Smax =	177.8	58.4	87.2	87.2	136.2	46.6	87.7	35.9
Allowable Stress, Smax = 1.5*Sm	2,109.2	2,109.2	2,109.2	2,109.2	2,109.2	2,109.2	2,109.2	2,109.2
Judgement	O.K	O.K	O.K	O.K	O.K	O.K	O.K	O.K

MENU PAGE--->

Copyright © 2001 피이에스21 All rights reserved.
Please contact E-mail ***pes21@pes21.com***