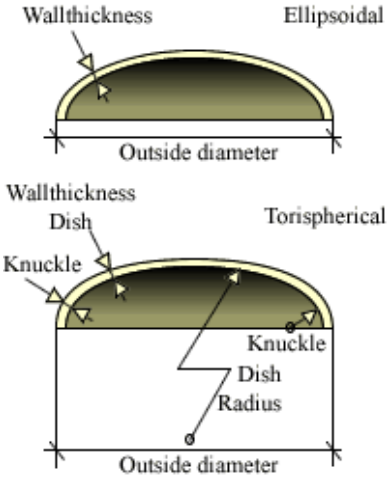
Today is Mon, Mar 19th, 2012
Engineering Tools > Head Wall Thickness

Type of shell		Kloepper		
Design pressure	P	1.54	N/mm^2	(= 1 MPa = 10 Bar)
Design temperature	T	25	^{0}C	
Material description		A-240-GR.316		
Select yield stress and specific gravity from material database >				
Yield stress, design temperature	$R_{p0.2/t}$	206	N/mm^2	
Specific gravity	ϱ	7850	kg/m^3	
Outside diameter	D_e	1360	mm	
Nominal wall thickness	e_n	12	mm	
Inside radius knuckle nominal	r_n	see below	mm	only for torisph.
Inside radius dish nominal	R_n	see below	mm	only for torisph.
Corrosion allowance	Ca	0	mm	
Tolerance	tol	0	mm	
Weld joint efficiency	z	1	-	
Design Code		Euronorm (PED)		(ASME, Dutch R., PED)

Close Calculate

Heads



Note: Without warranty and for estimating purposes only. Results should be checked and approved by qualified engineer.

Wall thickness calculation of Kloepper head
according Euronorm (PED)

Calculation thickness	$e_a = e_n - Ca - tol =$	12 - 0 - 0 =	12.00 mm
Inside diameter	$D_i = D_e - 2*e_n =$	1360 - 2* 12 =	1336.00 mm
Inside radius knuckle nom.	$r_n = 0.1 * D_e =$	0.1 * 1360 =	136 mm
Inside radius dish nominal	$R_n = D_e =$	1360 =	1360 mm
Inside radius knuckle	$r = r_n + Ca + tol =$	136 + 0 + 0 =	136 mm
Inside radius dish	$R = R_n + Ca + tol =$	1360 + 0 + 0 =	1360 mm

Kloepper head:

(constant X)	$X = r / D_i =$	136.00 / 1336.00 =	0.10
(constant Y)	$Y = \min(e_a / r, 0.04) =$	min(12.00 / 1360.00 , 0.04) =	0.01
(constant Z)	$Z = \log10(1 / Y) =$	log10(1 / 0.01) =	2.05
(constant N)	$N = 1.006-(1/(6.2+(90*Y)^4)) =$	$1.006 - (1 / (6.2 + (90* 0.01)^4 =$	0.85
(constant Beta0.06)	$\beta_{006} = N*(-0.3635*Z^3 + 2.2124*Z^2 - 3.2937*Z + 1.8873) =$		
	$==> 0.85*(-0.3635* 2.05^3 + 2.2124* 2.05^2 - 3.2937* 2.05 + 1.8873) =$		1.12
(constant Beta0.10)	$\beta_{010} = N*(-0.1833*Z^3 + 1.0383*Z^2 - 1.2943*Z + 0.837) =$		
	$==> 0.85*(-0.1833* 2.05^3 + 1.0383* 2.05^2 - 1.2943* 2.05 + 0.837) =$		0.83

(constant Beta0.20)	$\beta_{020} = \max(0.95*(0.56-1.94*Y-82.5*Y^2), 0.5) =$ $\Rightarrow \max(0.95*(0.56-1.94*0.01-82.5*0.01^2), 0.5) =$		0.51
(constant Beta)	$\beta = 10*((0.2-X)*\beta_{010} + (X-0.1)*\beta_{020}) =$ $\Rightarrow 10*((0.2-0.10)*0.83 + (0.10-0.1)*0.51) =$		0.82
Allowable stress	$f = 0.67 * R_e(T_d) =$	$0.67 * 206.00 =$	138.02 N/mm^2
Allowable stress	$f_b = 0.67 * R_e(T_d) =$	$0.67 * 206.00 =$	138.02 N/mm^2
Required wall thickn. knuckle	$e_y = \frac{\beta*P*(0.75*R+0.2*D_i)}{f} =$		
	$\Rightarrow \frac{0.82*1.54*(0.75*1360.00+0.2*1336.00)}{(138.02)} =$		11.83 mm
Required wall thickn. knuckle	e_b calculation not required when $e_y > 0.005*D_i$		
Nominal required thickness k.	$e_{rk} = \max(e_y, e_b) + Ca + tol = 11.83 + 0.00 + 0.00 =$		11.83 mm
Required wall thickn. dish	$e_s = \frac{P * R}{(2*f*z - 0.5*P)} =$	$\frac{1.54*1360.00}{(2*138.02*1.00 - 0.5*1.54)} =$	7.61 mm
Nominal required thickness d.	$e_{rs} = e_s + Ca + tol =$	$7.61 + 0.00 + 0.00 =$	7.61 mm
Analysis, $e_n > e_{rk}$ and e_{rs} ?	$e_n = 12$ mm is OK		
Weight			178.46 kg
Enclosed volume			0.307 m^3