



Reinforcement in Flat Head Opening

PREPARED: P.G.A.Engineering

CHECKED:

APPROVED:

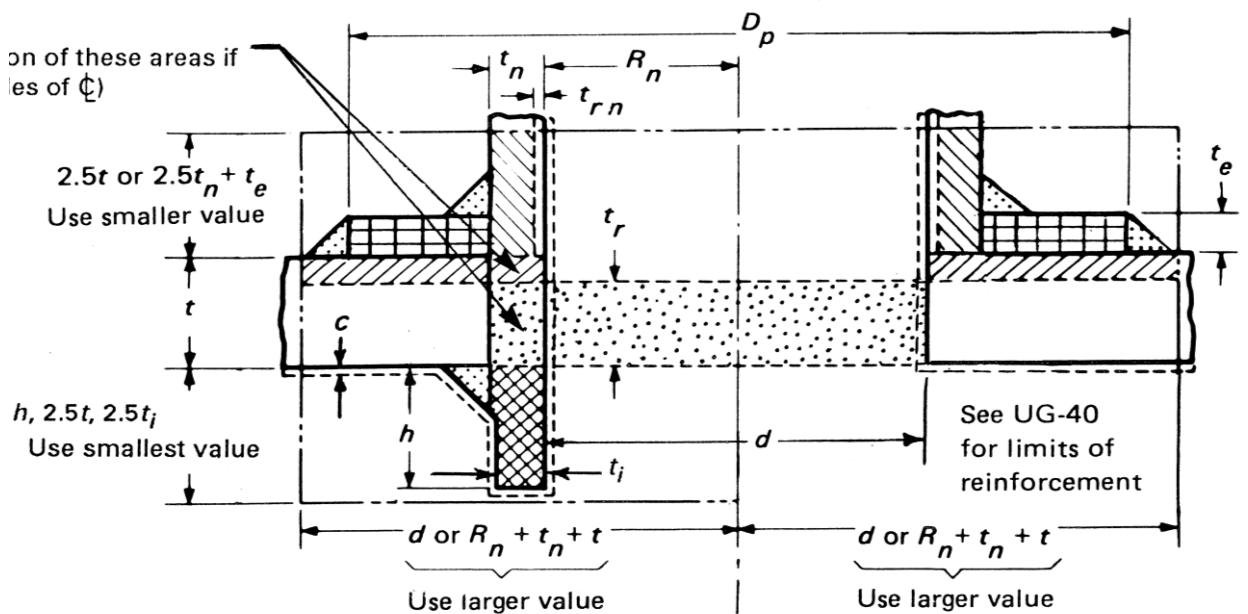
DATE: 29/04/2014

This calculation is according to ASME VIII Div.1

Material of eventually Element of Reinforcement	A182 F316L (Forgings)		
Angle of Nozzle axis with longitudinal Vessel axis	0°		
Thickness or height of reinforcement element	t_e	0,0	mm
Outside diameter of reinforcement element	D_p	0,0	mm
Distance nozzle Projects beyond the inner surface of Vessel	h	0,0	mm

CALCULATION

DESCRIPTION	DEF.	Imperial		Metric	
		Values	Unit of Measure	Values	Unit of Measure
INPUT					
Flat Head Thickness	t_H	1,378	in	35	mm
Minimum Flat Head Thickness Required	$t_{r,H}$	0,3743	in	9,506	mm
Nozzle Pipe Wall Thickness	t_n	0,118	in	3,00	mm
Minimum Thickness Required	t_{nr}	0,001	in	0,03	mm
Inside Diameter of Nozzle Pipe	d	0,815	in	20,70	mm
Distance nozzle Projects beyond the inner surface of Vessel	h	0,000	in	0	mm
Thickness or height of reinforcement element	t_e	0,000	in	0	mm
Outside diameter of reinforcement element	D_p	0,000	in	0	mm
Allowable Reinforcement Stress at Operating Condition	$S_{R2,OP}$	16700	psi	115	MPa



For nozzle wall inserted through the vessel wall → ← For nozzle wall abutting the vessel



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DESCRIPTION	DEF.	Imperial		Metric	
		Values	Unit of Measure	Values	Unit of Measure
OUTPUT					
Strenght Reduction Factor	f_{r1}	0,86	-	0,86	-
Strenght Reduction Factor	f_{r2}	0,86	-	0,86	-
Strenght Reduction Factor	f_{r3}	0,86	-	0,86	-
Strenght Reduction Factor	f_{r4}	0,86	-	0,86	-
Correction Factor	F	1		1	
Total cross-sectional Area of Reinforcement Required	A	0,58	sq in	377	mm ²
Area in excess thickness in vessel wall aviable for reinforcement	A_1	2,97	sq in	1916	mm ²
Area in excess thickness in nozzle wall aviable for reinforcement	A_2	0,06	sq in	38	mm ²
Area aviable for reinforcement when the nozzle extends inside the vessel	A_3	0,00	sq in	0	mm ²
Cross-sectional area of outward nozzle weld aviable for reinforcement	A_{41}	0,01	sq in	5	mm ²
Cross-sectional area of outer element weld aviable for reinforcement	A_{42}	0,00	sq in	0	mm ²
Cross-sectional area of inward nozzle weld aviable for reinforcement	A_{43}	0,01	sq in	5	mm ²
Cross-sectional area of material added as reinforcement	A_5	0,00	sq in	0	mm ²
Total Area aviable for reinforcement	A_{TOT}	3,04	sq in	1964	mm ²

VERIFICATION

Description	Formula	CHECK
REINFORCEMENT AREA VERIFICATION	$A_{TOT} \geq A$	VERO
REINFORCING ELEMENT OUTSIDE DIAMETER VERIFICATION	$D_p \leq \text{LIMITS OF REINF.}$	VERO