

REINFORCEMENT FOR OPENINGS

02/23/09

FOR NOZZLE: **WINDOW**
 LOCATED IN: **SHELL**

REF: ASME CODE SECTION VIII DIVISION 1- 2007 EDITION - 08 ADDENDA
 PARAGRAPH UG-36 THROUGH UG-44.

DESIGN CONDITIONS:

DESIGN PRESSURE = P: 15 PSI
 DESIGN TEMPERATURE = T = 300 DEG F
 CORROSION ALLOWANCE = c: 0 INCHES

VESSEL O.D. = 6.625 INCHES
 VESSEL O.R. = 3.3125 INCHES
 NOM. VESSEL THICKNESS= 0.28 INCHES

OUTSIDE DIA OF NOZZLE = 2.375 INCHES
 NOZZLE NOM. THICKNESS = 0.154 INCHES

MATERIALS:

VESSEL
 TYPE: CARBON STEEL
 SA OR SB SPEC: SA-106-B
 ALLOWABLE STRESS: 17100
 PER: SEC II-D TABLE 1-A pg 10-13

NOZZLE
 TYPE: CARBON STEEL
 SA OR SB SPEC: SA-106-B
 ALLOWABLE STRESS: 17100
 PER: SEC II-D TABLE 1-A pg 10-13

REQUIRED THICKNESS CALCULATIONS FOR VESSEL: THE NOZZLE IS LOCATED IN THE VESSEL SHELL
 (USE APPROPRIATE CONDITION)

NOTE: SEE UG-37(a) FOR DEFINITIONS OF tr

SHELL:	TORISPHERICAL HEAD:	ELLIPSOIDAL HEAD: (IN CIRCLE WITHIN 80% OF SHELL DIA.)
E = 1	(ENTIRELY IN SPHERICAL PORTION)	REFERENCE: 80% DIA. = 5.3 INCHES
	M = 0	RADIUS = 2.65 INCHES
	L = 0	C/L NOZZLE TO C/L VESSEL = 0 IN.
		O.K.
		K1 = 0
tr = PRo / (SE + 4P)	tr = PLM / (2SE - 2P)	tr = PK1D / (2SE + 1.8P)
→ tr = 0.0029	tr = 0.0000	tr = 0.0000

PER EXTERNAL PRESSURE CALCS: tr = 0.0000

REQUIRED VESSEL THICKNESS TO BE USED IN REINFORCEMENT CALCULATIONS: tr = 0.0029 INCHES

REQUIRED THICKNESS CALCULATIONS FOR NOZZLE:

trn = PRon / (S(1) + 4P)
 trn = 0.0010 INCHES

REQUIRED NOZZLE THICKNESS TO BE USED IN REINFORCEMENT CALCULATIONS: trn = 0.0010 INCHES

THICKNESSES USED FOR REINFORCEMENT CALCULATIONS:

VESSEL WALL THICKNESS = t: 0.2450 INCHES
 NOZZLE THICKNESS = tn: 0.1540 INCHES
 FIN. DIA OF OPENING = d: 2.0670 INCHES
 NOM. THK. OF INT. PROJECTION = ti: 0.1540 INCHES

OPENING CONFIGURATION:

REF. NOZZLE ATTACHMENT DRAWING: UW-16.1(c)

NOZZLE PROJ. INTO VESSEL = h = 1.000 INCHES

NOZZLE PROJECTION INSIDE
 BEYOND VESSEL WALL = 0.385 INCHES
 FOR REINFORCEMENT CALCS. USE LEAST OF:

EXTERIOR NOZZLE WELD LEG SIZE =W41 : 0.250 INCHES
 INTERIOR NOZZLE WELD LEG SIZE= W43 = 0.000 INCHES
 REINFORCING PAD WELD LEG SIZE= W42 : 0.000 INCHES
 NOZZLE TO SHELL GROOVE WELD USED? YES

ACTUAL PROJ. = 1.000
 2.5*t = 0.613
 2.5*tn = 0.385

FACTORS:

STRESS ON DIFFERENT PLANES
 (F FACTOR) = F = 1 SEE FIG. UG-37

FORCE REDUCTION FACTOR = fr:
 fr1 = 1.000 = Sn/Sv (FOR NOZZLE THROUGH WALL)
 (USE 1.0 FOR NOZZLE ABUTTING WALL)
 fr2 = 1.000 = Sn/Sv
 fr3 = 0.000 USE LESSER OF: Sn/Sv = 1
 OR: Sp/Sv = 0
 fr4 = 0.000 = Sp/Sv

JOINT EFFICIENCY = E1 = 1 WHEN OPENING IS IN SOLID PLATE OR CAT. B BUTT JOINT
 = JOINT EFFICIENCY PER TABLE UW-12 IF OPENING PASSES
 THROUGH A WELDED JOINT