SHELL THICKNESS CALCULATIONS

BASED ON: INTERNAL PRESSURE 02/24/09

FOR: **WATER TANK** OUTSIDE DIAMETER AND RADIUS

REF: ASME CODE SECTION VIII DIVISION 1- 2007 EDITION
PARAGRAPH UG-27 AND APPENDIX 1 PARAGRAPH 1-1.

DESIGN CONDITIONS

DESIGN PRESSURE = P	**20**	PSI
DESIGN TEMPERATURE = T	**300**	DEG F
CORR. ALLOWANCE = CA	**0**	INCHES
MATERIAL STRESS VALUE = S	17100	PSI
OUTSIDE DIAMETER = Do	6.625	INCHES
OUTSIDE RADIUS = Ro	3.3125	INCHES
SHELL LENGTH = L	12	INCHES

MATERIAL:

TYPE: **CARBON STEEL** WT/CU.IN.= 0.283
PIPE OR PLATE: **PIPE** SEAMLESS: YES
SA OR SB SPEC: **SA-106-B**
ALLOWABLE STR = **17100** PER: SEC II-D TABLE 1-A pg 10-13

CONSTRUCTION:

DEGREE OF RT: LONG. SEAM: NONE
CIRC. SEAM: NONE
JT. EFF. (LONG. JOINT) = E 0.85 PER: PARA. UW-12(d)
JT. EFF. (CIRC. JOINT) = E 0.7 PER: PARA. UW-12(d)

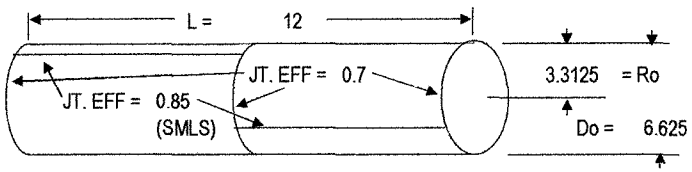
CALCULATIONS:

LONG. SEAM (CIRC. STRESS)
t = PRo / (SE+.4P) 0.0046
CA = 0.0000

CALCULATED DESIGN THICKNESS = 0.0052
(CONSIDERING PIPE MFG. UNDERTOLERANCE)

CIRC. SEAM (LONG. STRESS)
t = PRo / (2SE+.4P) 0.0028
CA = 0.0000

CALCULATED DESIGN THICKNESS = 0.0032
(CONSIDERING PIPE MFG. UNDERTOLERANCE)



TEST FOR LIMITS OF UG-27:

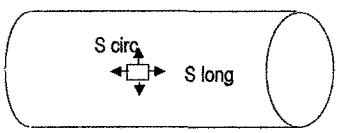
CIRC STRESS (LONG JOINTS):		LONG STRESS (CIRC JOINTS):		SHELL THICKNESS:	
P =	20	P =	20	t =	0.005
.385SE =	5595.975	1.25SE =	11970	.5 I.R. =	1.51625
O.K.		**O.K.**		**O.K.**	

SUMMARY:

** **MINIMUM SHELL THICKNESS REQUIRED TO SATISFY DESIGN CONDITIONS =** **0.005** **INCHES** **

** SELECT tnom = **0.28** INCHES NOMINAL SHELL THICKNESS **

AT SELECTED NOMINAL SHELL THICKNESS:			**@ DESIGN TEMP.**			**@ AMBIENT (TEST) TEMP**		
MATERIAL ALLOWABLE STRESS (@ AMBIENT) =	17100	PSI	**MAXIMUM ALLOWABLE WORKING PRESSURE**			**MAXIMUM ALLOWABLE PRESSURE**		
MATERIAL ALLOWABLE STRESS (@ DESIGN) =	17100	PSI						
CONDITION: >			**NEW**	**CORRODED**		**NEW**	**CORRODED**	
PRESSURE: USING: >			t = tnom	t = tnom - C.A.		t = tnom	t = tnom - C.A.	
CIRCUMFERENTIAL STRESS (LONGITUDINAL SEAM) P = SEt /(Ro - .4t) =			1271.6	1271.6		1271.6	1271.6	
LONGITUDINAL STRESS (CIRC. (GIRTH) SEAM) P = 2*SEt /(Ro - .4t) =			2094.4	2094.4		2094.4	2094.4	
MAXIMUM PRESSURE FOR COMPONENT: **Pmax =**			**1272**	**1272**	PSI	**1272**	**1272**	PSI
STRESSES IN SHELL DUE TO DESIGN PRESSURE =	20	PSI						
LONGITUDINAL JOINT E =	0.85		**NEW**	**CORRODED**		**NEW**	**CORRODED**	
(CIRCUMFERENTIAL STRESS) S circ = (PD/2t) / E =			278	278	PSI	278	278	PSI
% OF MATERIAL ALLOWABLE STRESS (@ DESIGN) =			1.6%	1.6%		1.6%	1.6%	
CIRCUMFERNETIAL JOINT E =	0.7							
(LONGITUDINAL STRESS) S long = (PD/4t) / E =			169	169	PSI	169	169	PSI
% OF MATERIAL ALLOWABLE STRESS (@ AMBIENT) =			1.0%	1.0%		1.0%	1.0%	



MATERIAL SPECIFICATION

MATERIAL:	CARBON STEEL	
ASME SPEC:	SA-106-B	
THICKNESS:	0.28	INCHES
OUTSIDE DIAMETER:	6.625	INCHES
ESTIMATED WT:	20	LBS