

CAESAR II 2018 Ver.10.00.02.0400, (Build 180918) Date: JUL 2, 2020 @16: 1
 Job: E:\Project\00. JOB\43712 (MPGF)\01. CAESAR-II\16inch-flange leak per BPVC
 Appendix2-FLG Fail.FLG

CAESAR II ANALYSIS REPORT: Flange Leakage/Stress Calculations

FLANGE LEAKAGE/STRESS CALCULATIONS

Flange Inside Diameter [B] (User to verify)	(mm.)	387.350
Flange Thickness [t].....	(mm.)	35.000
Flange Rating (Optional)		150.000
Bolt Circle Diameter	(mm.)	539.800
Number of Bolts		16.000
Bolt Diameter	(mm.)	25.400
Bolt Initial Tightening Stress	(MPa)	
Uncompressed Gasket Thickness	(mm.)	4.500
Grade of Attached B16_5 ANSI Flange.....		1.100
Leak Pressure Ratio [m]		3.000
Effective Gasket Modulus	(KPa)	3016456.000
Externally Applied Moment	(optional)(N.m.)	1.000
Externally Applied Force	(optional)(N.)	1.000
Pressure [P].....	(bars)	0.001
Disable Stress Calculations (Y/N)		N
Flange Type (1-8, see ?-Help or Alt-P to plot)		1.000
Flange Outside Diameter [A].....	(mm.)	595.000
Design Temperature	C	21.003
Small End Hub Thickness [g0].....	(mm.)	9.525
Large End Hub Thickness [g1].....	(mm.)	34.825
Hub Length [h].....	(mm.)	90.000
Flange Allowable @Design Temperature	(MPa)	137.900
Flange Allowable @Ambient Temperature	(MPa)	137.900
Flange Modulus of Elasticity @Design	(KPa)	202701296.000
Flange Modulus of Elasticity @Ambient	(KPa)	202701296.000
Bolt Allowable @Design Temperature	(MPa)	172.375
Bolt Allowable @Ambient Temperature	(MPa)	172.375
Gasket Seating Stress [y]	(MPa)	68.950
Flange Allowable Stress Multiplier		1.000
Bolt Allowable Stress Multiplier (VIII Div 2 4-141) ...		1.000
Disable Leakage Calculations (Y/N)		N
Disable ANSI B16.5 Checks (Y/N)		N
Flange Face OD or Lapjt Cnt OD.....	(mm.)	469.900
Flange Face ID or Lapjt Cnt ID.....	(mm.)	387.350
Gasket Outer Diameter	(mm.)	463.600
Gasket Inner Diameter	(mm.)	422.400
Nubbin Width	(mm.)	
Facing Sketch		2.000
Facing Column		2.000

Flange Type: (Integral Weld Neck)

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Effective gasket width parameters:

Effective gasket seating width, b.....(mm.) 8.0873
 Diameter of gasket load reaction, G....(mm.) 447.4253

SAFETY FACTOR SUMMARY for the different Flange Models
 analyzed. (SAFETY FACTOR = Allowed/Actual)

	SAFETY FACTOR
Flexibility/Gasket Compression Model (Leakage) ..	99999.00
ANSI B16.5/Equivalent Pressure (Stress)	12038.80
ASME Model Operating (Stress)	20691.73
ASME Model Seating (Stress)	0.94

FLANGE FLEXIBILITY MODEL -----

BOLTED FLANGE CHARACTERISTICS:

Initial Tightening Stress in the Bolt (Not the seating
 stress): 310 MPa

Approximate Torque required to induce the above initial
 stress: 420 N.m.

GASKET COMPRESSION:	COMPRESSION (mm.)
After Initial Boltup (Ci)	0.1650473028
Loss-of due to Pressure (Cp)	0.0000007674
Loss-of due to Applied Moment (Cm) ..	0.0000004363
Loss-of due to Applied Force (Cf) ...	0.0000000488
Loss-of due to all loads (CL)	0.0000012525
Initial minus all Losses (Ci-CL)	0.1650460511
For Leak-Proof Joint (Creq)	0.0000008951
Excess available (Ci-Creq)	0.1650464088

LEAKAGE SAFETY FACTOR: (If less than one then joint
 leakage is predicted.) (Allowed/Actual)

Pressure Only (Ci-Creq)/Cp	99999.00
Force Only (Ci-Creq)/Cf	99999.00
Moment Only (Ci-Creq)/Cm	99999.00
Pressure+Force+Moment (Ci-Creq)/CL	99999.00

EQUIVALENT PRESSURE MODEL -----

Equivalent Pressure (bars)	0.00
ANSI B16.5 Flange Allowable Pressure Rating .	19.65

STRESS SAFETY FACTOR: (If less than one then joint
 failure is predicted.) (Allowed/Actual)

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ANSI B16.5/Equivalent Pressure 12038.80

ASME SECT VIII DIV 1 STRESS MODEL -----

ACCORDING TO A05 APP 2-14, THE FOLLOWING RIGIDITY
 FACTORS SHOULD BE LESS THAN 1.0

ASME Rigidity Factor "J", Operating Case 0.0000
 ASME Rigidity Factor "J", Seating Case 0.3133

CALCULATED STRESSES (MPa)

	OPERATING -----	ALLOW -----	SEATING -----	ALLOW -----
Longitudinal Hub ..	0	207	101	207
Radial Flange	0	138	146	138 *
Tangential Flange .	0	138	42	138
Maximum Average ...	0	138	124	138
Bolting	0	172	138	172

"*" Indicates Failure for an item.

STRESS SAFETY FACTOR: (If less than one then joint
 failure is predicted.) (Allowed/Actual)

	OPERATING -----	SEATING -----
Longitudinal Hub	44782.98	2.04
Radial Flange	20691.73	0.94
Tangential Flange ...	71811.28	3.27
Maximum Average	24442.90	1.11
Bolting	30180.58	1.25