900 Rating, Carbon Steel Flanges at **300 degree C**			
Pipe Size	Rated Pressure (Bars)	ASME VIII Result	
2	119.5	Pass	Pipe Data Pipe Size Sch Material 2 (Inch) 160 A106-B 4-16 (Inch) 120 A106-B Corrosion Allowance = 3.175 mm Flange Data Size Rating Sch Material 2 (Inch) 900 160 A105N 4-16 (Inch) 900 120 A105N Bolt Data 2-16 (Inch) Stud bolt B7/2H Gasket Type Spiral Wound- SS
4	119.5	Pass	
6	119.5	Pass	
8	119.5	Fails at rated pressure	
10	119.5	Fails at rated pressure	
12	119.5	Fails at rated pressure	
14	119.5	Pass	
16	119.5	Fails at rated pressure	
20	119.5	Pass	
24	119.5	Pass	

Remarks

1. Flange and Bolt materials are used as per Section II part D as mentioned in ASME VIII Appendix 2.

8 Inch, 900 Rating Flange

FLANGE LEAKAGE/STRESS CALCULATIONS
Flange Inside Diameter [B] (User to verify) .....(mm.) 188.930
Flange Thickness [t].....(mm.) 63.500
Flange Rating (Optional) 900.000

Bolt Circle Diameter .....(mm.) 393.700
Number of Bolts 12.000
Bolt Diameter .....(mm.) 34.925
Bolt Initial Tightening Stress .....(N./sq.mm.)

Uncompressed Gasket Thickness .....(mm.) 4.445
Grade of Attached B16_5 ANSI Flange..... 1.100
Leak Pressure Ratio [m] 3.000
Effective Gasket Modulus .....(N./sq.mm.) 3016.000

Externally Applied Moment ..... (optional) ....(N.m.)
Externally Applied Force ..... (optional) .....(N.)
Pressure [P].....(bars) 119.500

Disable Stress Calculations (Y/N) ..... N

Flange Type (1-8, see ?-Help or Alt-P to plot) 1.000

Flange Outside Diameter [A].....(mm.) 469.900
Design Temperature ..... C 300.000

Small End Hub Thickness [g0].....(mm.) 15.140
Large End Hub Thickness [g1].....(mm.) 54.760
Hub Length [h].....(mm.) 98.552

Flange Allowable @Design Temperature .....(N./sq.mm.) 126.860
Flange Allowable @Ambient Temperature .....(N./sq.mm.) 137.892
Flange Modulus of Elasticity @Design .....(N./sq.mm.) 185305.938
Flange Modulus of Elasticity @Ambient .....(N./sq.mm.) 203452.625
Bolt Allowable @Design Temperature .....(N./sq.mm.) 172.360
Bolt Allowable @Ambient Temperature .....(N./sq.mm.) 172.360
Gasket Seating Stress [y] .....(N./sq.mm.) 68.948

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.) 269.750
Flange Face ID or Lapjt Cnt ID.....(mm.) 188.930
Gasket Outer Diameter .....(mm.) 257.300
Gasket Inner Diameter .....(mm.) 222.250
Nubbin Width .....(mm.)
Facing Sketch 2.000
Facing Column 2.000

Flange Type: (Integral Weld Neck)

Effective gasket width parameters:
Effective gasket seating width, b.....(mm.) 7.4593
Diameter of gasket load reaction, G....(mm.) 242.3813

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

	SAFETY FACTOR
Flexibility/Gasket Compression Model (Leakage)..	8.19
ANSI B16.5/Equivalent Pressure (Stress).....	0.97
ASME Model Operating (Stress).....	1.05
ASME Model Seating (Stress).....	0.91

FLANGE FLEXIBILITY MODEL ----------

BOLTED FLANGE CHARACTERISTICS:

Initial Tightening Stress in the Bolt (Not the seating stress): 265 N./sq.mm.

Approximate Torque required to induce the above initial stress: 1033 N.m.

GASKET COMPRESSION:	COMPRESSION (mm.)
After Initial Boltup (Ci).....	0.3946161270
Loss-of due to Pressure (Cp).....	0.0352659337
Loss-of due to Applied Moment (Cm)..	0.0000000000
Loss-of due to Applied Force (Cf)...	0.0000000000
Loss-of due to all loads (CL).....	0.0352659337
Initial minus all Losses (Ci-CL)....	0.3593501747
For Leak-Proof Joint (Creq).....	0.1056719348
Excess available (Ci-Creq)	0.2889441848

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

Pressure Only (Ci-Creq)/Cp 8.19
Force Only (Ci-Creq)/Cf 99999.00
Moment Only (Ci-Creq)/Cm 99999.00

Pressure+Force+Moment (Ci-Creq)/CL 8.19

EQUIVALENT PRESSURE MODEL ----------

Equivalent Pressure (bars) 119.50
ANSI B16.5 Flange Allowable Pressure Rating . 116.07

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

ANSI B16.5/Equivalent Pressure 0.97

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 0.1365
ASME Rigidity Factor "J", Seating Case 0.1564

CALCULATED STRESSES (N./sq.mm.)

	OPERATING	ALLOW	SEATING	ALLOW
Longitudinal Hub ..	86	190	108	207
Radial Flange	120	127	151	138 *
Tangential Flange .	57	127	71	138
Maximum Average ...	103	127	129	138
Bolting	107	172	44	172

"*" Indicates Failure for an item.

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

	OPERATING	SEATING
Longitudinal Hub	2.22	1.92
Radial Flange	1.05	0.91
Tangential Flange ...	2.24	1.93
Maximum Average	1.23	1.07
Bolting	1.61	3.94

10 Inch, 900 Rating Flange

FLANGE LEAKAGE/STRESS CALCULATIONS
Flange Inside Diameter [B] (User to verify) .....(mm.) 236.590
Flange Thickness [t].....(mm.) 69.850
Flange Rating (Optional) 900.000

Bolt Circle Diameter .....(mm.) 469.900
Number of Bolts 16.000
Bolt Diameter .....(mm.) 34.925
Bolt Initial Tightening Stress .....(N./sq.mm.)

Uncompressed Gasket Thickness .....(mm.) 4.445
Grade of Attached B16_5 ANSI Flange..... 1.100
Leak Pressure Ratio [m] 3.000
Effective Gasket Modulus .....(N./sq.mm.) 3016.000

Externally Applied Moment ..... (optional) ....(N.m.)
Externally Applied Force ..... (optional) .....(N.)
Pressure [P].....(bars) 119.500

Disable Stress Calculations (Y/N) ..... N

Flange Type (1-8, see ?-Help or Alt-P to plot) 1.000

Flange Outside Diameter [A].....(mm.) 546.100
Design Temperature ..... C 300.000

Small End Hub Thickness [g0].....(mm.) 18.230
Large End Hub Thickness [g1].....(mm.) 65.860
Hub Length [h].....(mm.) 114.300

Flange Allowable @Design Temperature .....(N./sq.mm.) 126.860
Flange Allowable @Ambient Temperature .....(N./sq.mm.) 137.892
Flange Modulus of Elasticity @Design .....(N./sq.mm.) 185305.938
Flange Modulus of Elasticity @Ambient .....(N./sq.mm.) 203452.625
Bolt Allowable @Design Temperature .....(N./sq.mm.) 172.360
Bolt Allowable @Ambient Temperature .....(N./sq.mm.) 172.360
Gasket Seating Stress [y] .....(N./sq.mm.) 68.948

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.) 323.850
Flange Face ID or Lapjt Cnt ID.....(mm.) 236.590
Gasket Outer Diameter .....(mm.) 311.150
Gasket Inner Diameter .....(mm.) 276.350
Nubbin Width .....(mm.)
Facing Sketch 2.000
Facing Column 2.000

Flange Type: (Integral Weld Neck)

Effective gasket width parameters:

Effective gasket seating width, b.....(mm.) 7.4327
Diameter of gasket load reaction, G....(mm.) 296.2846

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

	SAFETY FACTOR
Flexibility/Gasket Compression Model (Leakage)..	7.24
ANSI B16.5/Equivalent Pressure (Stress).....	0.97
ASME Model Operating (Stress).....	0.94
ASME Model Seating (Stress).....	0.82

FLANGE FLEXIBILITY MODEL ----------

BOLTED FLANGE CHARACTERISTICS:

Initial Tightening Stress in the Bolt (Not the seating stress): 265 N./sq.mm.

Approximate Torque required to induce the above initial stress: 1033 N.m.

GASKET COMPRESSION:	COMPRESSION (mm.)
After Initial Boltup (Ci).....	0.4319740832
Loss-of due to Pressure (Cp).....	0.0450405627
Loss-of due to Applied Moment (Cm)..	0.0000000000
Loss-of due to Applied Force (Cf)...	0.0000000000
Loss-of due to all loads (CL).....	0.0450405627
Initial minus all Losses (Ci-CL)....	0.3869335055
For Leak-Proof Joint (Creq).....	0.1056719348
Excess available (Ci-Creq)	0.3263021410

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

Pressure Only (Ci-Creq)/Cp 7.24
Force Only (Ci-Creq)/Cf 99999.00
Moment Only (Ci-Creq)/Cm 99999.00

Pressure+Force+Moment (Ci-Creq)/CL 7.24

EQUIVALENT PRESSURE MODEL ----------

Equivalent Pressure (bars) 119.50
ANSI B16.5 Flange Allowable Pressure Rating . 116.07

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

ANSI B16.5/Equivalent Pressure 0.97

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 0.1411
ASME Rigidity Factor "J", Seating Case 0.1603

CALCULATED STRESSES (N./sq.mm.)

	OPERATING	ALLOW	SEATING	ALLOW
Longitudinal Hub ..	84	190	104	207
Radial Flange	134	127	168	138 *
Tangential Flange .	54	127	68	138
Maximum Average ...	109	127	136	138
Bolting	111	172	40	172

"*" Indicates Failure for an item.

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

	OPERATING	SEATING
Longitudinal Hub	2.28	1.98
Radial Flange	0.94	0.82
Tangential Flange ...	2.34	2.04
Maximum Average	1.16	1.01
Bolting	1.56	4.31

12 Inch, 900 Rating

FLANGE LEAKAGE/STRESS CALCULATIONS
Flange Inside Diameter [B] (User to verify) .....(mm.) 279.450
Flange Thickness [t].....(mm.) 79.248
Flange Rating (Optional) 900.000

Bolt Circle Diameter .....(mm.) 533.400
Number of Bolts 20.000
Bolt Diameter .....(mm.) 34.925
Bolt Initial Tightening Stress .....(N./sq.mm.)

Uncompressed Gasket Thickness .....(mm.) 4.445
Grade of Attached B16_5 ANSI Flange..... 1.100
Leak Pressure Ratio [m] 3.000
Effective Gasket Modulus .....(N./sq.mm.) 3016.000

Externally Applied Moment ..... (optional) ....(N.m.)
Externally Applied Force ..... (optional) .....(N.)
Pressure [P].....(bars) 119.500

Disable Stress Calculations (Y/N) ..... N

Flange Type (1-8, see ?-Help or Alt-P to plot) 1.000

Flange Outside Diameter [A].....(mm.) 609.600
Design Temperature ..... C 300.000

Small End Hub Thickness [g0].....(mm.) 22.200
Large End Hub Thickness [g1].....(mm.) 69.830
Hub Length [h].....(mm.) 120.904

Flange Allowable @Design Temperature .....(N./sq.mm.) 126.860
Flange Allowable @Ambient Temperature .....(N./sq.mm.) 137.892
Flange Modulus of Elasticity @Design .....(N./sq.mm.) 185305.938
Flange Modulus of Elasticity @Ambient .....(N./sq.mm.) 203452.625
Bolt Allowable @Design Temperature .....(N./sq.mm.) 172.360
Bolt Allowable @Ambient Temperature .....(N./sq.mm.) 172.360
Gasket Seating Stress [y] .....(N./sq.mm.) 68.948

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.) 381.000
Flange Face ID or Lapjt Cnt ID.....(mm.) 279.450
Gasket Outer Diameter .....(mm.) 368.300
Gasket Inner Diameter .....(mm.) 323.850
Nubbin Width .....(mm.)
Facing Sketch 2.000
Facing Column 2.000

Flange Type: (Integral Weld Neck)

Effective gasket width parameters:

Effective gasket seating width, b.....(mm.) 8.4003
Diameter of gasket load reaction, G....(mm.) 351.4995

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

	SAFETY FACTOR
Flexibility/Gasket Compression Model (Leakage)..	6.10
ANSI B16.5/Equivalent Pressure (Stress).....	0.97
ASME Model Operating (Stress).....	0.95
ASME Model Seating (Stress).....	0.90

FLANGE FLEXIBILITY MODEL ----------

BOLTED FLANGE CHARACTERISTICS:

Initial Tightening Stress in the Bolt (Not the seating stress): 265 N./sq.mm.

Approximate Torque required to induce the above initial stress: 1033 N.m.

GASKET COMPRESSION:	COMPRESSION (mm.)
After Initial Boltup (Ci).....	0.4027225673
Loss-of due to Pressure (Cp).....	0.0487083830
Loss-of due to Applied Moment (Cm)..	0.0000000000
Loss-of due to Applied Force (Cf)...	0.0000000000
Loss-of due to all loads (CL).....	0.0487083830
Initial minus all Losses (Ci-CL)....	0.3540141881
For Leak-Proof Joint (Creq).....	0.1056719348
Excess available (Ci-Creq)	0.2970506251

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

Pressure Only (Ci-Creq)/Cp 6.10
Force Only (Ci-Creq)/Cf 99999.00
Moment Only (Ci-Creq)/Cm 99999.00

Pressure+Force+Moment (Ci-Creq)/CL 6.10

EQUIVALENT PRESSURE MODEL ----------

Equivalent Pressure (bars) 119.50
ANSI B16.5 Flange Allowable Pressure Rating . 116.07

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

ANSI B16.5/Equivalent Pressure 0.97

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 0.1671
ASME Rigidity Factor "J", Seating Case 0.1743

CALCULATED STRESSES (N./sq.mm.)

	OPERATING	ALLOW	SEATING	ALLOW
Longitudinal Hub ..	94	190	108	207
Radial Flange	133	127	153	138 *
Tangential Flange .	58	127	67	138
Maximum Average ...	114	127	130	138
Bolting	122	172	43	172

"*" Indicates Failure for an item.

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

	OPERATING	SEATING
Longitudinal Hub	2.02	1.91
Radial Flange	0.95	0.90
Tangential Flange ...	2.17	2.06
Maximum Average	1.12	1.06
Bolting	1.41	4.02