PIPING CLASS: AF1A0F-FA

SECTION 1.0 – GENERAL

PIPE CLASS:	**AF1A0F-FA**	**DESIGN CODE:**	ASME B31.3
RATING:	150	**PWHT:**	NOTE-52
FLANGE FACE:	RF	**VALVE TRIM:**	SS316+HF/AL- BRONZE (Note 19)
BASIC MATERIAL:	NPS ½ - 3: SS 316 / 316L (GROUP 2.2) NPS 3 – 24: CS-FBE LINED (GROUP 1.1)	**SOUR:**	NO
CORROSION ALLOWANCE:	0 MM	**SPECIAL REQUIREMENT:**	NOTES: 102, 103, 104, 106

TEMPERATURE (DEG.C) AND PRESSURE (BARG) RATING – (NOTE-22)

TEMP.	-29	0	38	50	100
PRESS.	16.0	16.0	16.0	16.0	16.0

SERVICE

REFER TO PIPING CLASS INDEX

SIZE RANGE, PIPE WALL THICKNESS (MM) TABLE – (NOTE-36,80)

NPS	½	¾	1	1 ½	2	3
SCHEDULE	80S	80S	80S	80S	80S	40
THICKNESS	3.73	3.91	4.55	5.08	5.54	5.49

NPS	3	4	6	8	10	12	14	16	18	20	24
SCHEDULE	40	40	40	20	20	20	20	20	20	20	20
THICKNESS	5.49	6.02	7.11	6.35	6.35	6.35	7.92	7.92	7.92	9.53	9.53

PIPING CLASS: AF1A0F-FA

SECTION 2.0 - NOTES

GENERAL NOTES

1. IN LINE WITH AGES-GL-08-001 (PROCESS DESIGN BASIS) THE MINIMUM PIPING SIZE IS NPS 1. HOWEVER THE LINE SIZE IN THIS CLASS NPS 3/4 & NPS 1/2 ARE INCLUDED FOR INSTRUMENT CONNECTIONS ONLY.
2. ALL BUTT-WELDED COMPONENT THICKNESSES SHALL MATCH THE PIPE THICKNESS.
3. FOR SPECTACLE BLINDS (FIG-8 FLANGES) & BLINDS REFER TO SPECIFICATION AGES-SP-09-002.
7. BRANCH FOR THIS SIZES TO BE MADE USING 2" CS-FBE LINED FLANGE AND SS316/316L REDUCING FLANGE AND THEN SS316/316L COMPONENT
12. DUAL GRADE MATERIALS SHALL BE SUPPLIED CERTIFIED TO BOTH GRADES (SS 316/ SS316L) AND SHALL BE SUPPLIED IN THE SOLUTION ANNEALED CONDITION.
15. EXTERNAL FASTENERS (BOLTS, STUDS & NUTS) SHALL BE COATED WITH FLUOROCARBON POLYMER SYSTEM AND SHALL COMPLY WITH SALT SPRAY TEST AS PER MATERIAL SELECTION GUIDELINE AGES-GL-07-001.
19. PRESSURE -TEMPERATURE RATING & BRANCH FITTINGS FOR THE UNLISTED MATERIALS SHALL BE VERIFIED WITH VENDOR.
22. ALL PIPING COMPONENTS UPTO NPS 24 SHALL BE DESIGNED FOR VACUUM CONDITION. FOR HIGHER SIZES VACUUM DESIGN SHALL BE APPLICABLE IF INDICATED IN THE LINELIST.
36. PRESSURE-TEMPERATURE RATINGS FOR MIXED PIPE CLASSES OF LOWER PRESSURE TEMPERATURE RATING AS PER APPLICABLE GROUP.
52. PWHT SHALL BE BASED ON ASME B31.3 AND THE REQUIREMENTS OF SPECIFICATION AGES-SP-09-002 PIPING MATERIAL SPECIFICATION INDEX.
54. COMPLETE ORIFICE ASSEMBLY SHALL BE SUPPLIED WITH PAIR OF ORIFICE FLANGES EACH HAVING ONE NPS 1/2 FLANGED TAP (RATING SAME AS PIPE CLASS).
70. LOW STRESS SPIRAL WOUND GASKET.
71. TO BE USED ONLY WHEN INDICATED ON THE P&ID.
73. USE 2" FBE LINED REDUCING TEE & FLANGE OR 2" FBE LINED WELDOLET & FLANGE.
80. THE PIPE THICKNESS ARE CALCULATED BASED ON P-T RATING TABLE FOR THIS CLASS, HOWEVER FOR SIZES NPS 26 AND ABOVE THICKNESS SHALL BE CALCULATED BASED ON PROJECT PROCESS DESIGN PARAMETER.
81. PIPING CLASS COVERS ALL TYPES OF VALVES NORMALLY USED IN THE INDUSTRY. HOWEVER, VALVE TYPE SELECTION SHALL BE AS PER PROCESS ISOLATION PHILOSOPHY (AGES-PH-08-001, AGES-SP-09-003) AND P&ID.
83. WHEN SMALL END OF REDUCER IS NPS 16 & BELOW THE REDUCER SHALL BE SEAMLESS.
85. SMALL BORE PIPE THE MINIMUM SCHEDULE SHALL BE AS PER AGES-SP-09-001 APPENDIX A1.
102. WELDING IS NOT PERMITTED ON ANY INTERNAL FBE COATED PIPING COMPONENT.
103. FLANGED PIPING SPOOLS LENGTH ARE TO BE SPECIFIED BY THE COATING APPLICATOR.
104. ALL WETTED SURFACES ARE TO BE FULLY LINED, INCLUDING FLANGE FACE.
122. PREFABRICATED PIPE SPOOLS SHALL HAVE FLANGED ENDS AND BE LIMITED TO L AND Z SHAPES, AND SHALL BE INTERNALLY COATED, BAKED ON EPOXY PHENOLIC RESIN FBE (FUSION BONDED EPOXY). WELDS SHALL NOT BE ALLOWED AFTER INTERNAL COATING. LINE SHALL BE INTERNALY COATED WITH FBE AS PER A-5 OF AGES-SP-07-004 OR AS PER APPROVED PROJECT SPECIFICATION.
165. GASKET IS NOT REQUIRED WHEN BOLTING RUBBER LINED BUTTERFLY VALVES TO THE FLANGES.
203. MATING FLANGE FACING WITH FBE LINED SHALL BE FLAT FACE ONLY.

PIPING CLASS: AF1A0F-FA

SECTION 3.0 – BRANCH TABLE

90^0 BRANCH CONNECTIONS – SS316 (NOTE 19)

BRANCH PIPE (NPS)										
	3						E			
	2					E	T			
	1 ½				E	T	T			
	1			E	T	T	W			
	3/4		E	T	T	T	W			
	1/2	E	T	T	T	TR	W			
		1/2	**3/4**	**1**	**1 ½**	**2**	**3**			
		HEADER PIPE (NPS)								

LEGEND (STANDARD SYMBOLOGY)

E	EQUAL TEE
T	REDUCING TEE
W	WELDOLET

PIPING CLASS: AF1A0F-FA

90^0 BRANCH CONNECTIONS - CS+FBE LINED (NOTE 19)

BRANCH PIPE (NPS)	3	4	6	8	10	12	14	16	18	20	24
24											E
20										E	T
18									E	T	T
16								E	T	T	T
14							E	T	T	T	T
12						E	T	T	T	T	T
10					E	T	T	T	T	T	T
8				E	T	T	T	T	T	T	W
6			E	T	T	T	T	T	W	W	W
4		E	T	T	T	W	W	W	W	W	W
3	E	W	W	W	W	W	W	W	W	W	W
	3	4	6	8	10	12	14	16	18	20	24
	HEADER PIPE (NPS)										

LEGEND (STANDARD SYMBOLOGY)

E EQUAL TEE
T REDUCING TEE
W WELDOLET

PIPING CLASS: AF1A0F-FA

SECTION 4.0 – PIPING COMPONENTS

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
PIPE							
PIPE	½	1 ½	PE	SEAMLESS	B36.19	ASTM A312 TP 316/316L	1,85
PIPE	2	3	BE	SEAMLESS	B36.19	ASTM A312 TP 316/316L	
PIPE	3	24	BE	SEAMLESS	B36.10	ASTM A106 GR B – FBE LINED	102,103, 165
NIPPLE	1	2	PE	AS PIPE	B36.19	ASTM A312 TP 316/316L	85
FITTINGS							
ELBOW	½	1 ½	SW	90 DEGREE, CL 3000, LR, FORGED	B16.11	ASTM A182 GR F316/316L	
ELBOW	2	3	BE	90 DEGREE, LR, WROUGHT, SEAMLESS	B16.9	ASTM A403 GR WP316/316L-S	
ELBOW	3	24	BE	90 DEGREE, LR, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB – FBE LINED	2,102, 165
ELBOW	1	1 ½	SW	45 DEGREE, CL 3000, LR, FORGED	B16.11	ASTM A182 GR F316/316L	
ELBOW	2	3	BE	45 DEGREE, LR, WROUGHT, SEAMLESS	B16.9	ASTM A403 GR WP316/316L-S	
ELBOW	3	24	BE	45 DEGREE, LR, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB – FBE LINED	2,102, 165
SWAGE NIPPLE	¾	1 ½	PBE	CONCENTRIC, WROUGHT, SEAMLESS	MSS SP-95	ASTM A403 GR WP316/316L-S	
SWAGE NIPPLE	¾	1 ½	PBE	ECCENTRIC, WROUGHT, SEAMLESS	MSS SP-95	ASTM A403 GR WP316/316L-S	
REDUCER COUPLING	¾	1 ½	SW	CL.3000,CONCENTRIC REDUCER COUPLING FORGED	B16.11	ASTM A182 GR F316/316L	
REDUCER	2	3	BE	CONCENTRIC, WROUGHT, SEAMLESS	B16.9	ASTM A403 GR WP316/316L-S	
REDUCER	4	24	BE	CONCENTRIC, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB – FBE LINED	2,83,102, 165
REDUCER	2	3	BE	ECCENTRIC, WROUGHT, SEAMLESS	B16.9	ASTM A403 GR WP316/316L-S	
REDUCER	4	24	BE	ECCENTRIC, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB – FBE LINED	2,83,102, 165

PIPING CLASS: AF1A0F-FA

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
FITTINGS – CONT'D							
REDUCER COUPLING	¾	1 ½	SW	CL.3000, ECCENTRIC REDUCER COUPLING FORGED	B16.11	ASTM A182 GR F316/316L	
CAP	½	1 ½	SW	CL 3000, FORGED	B16.11	ASTM A182 GR F316/316L	
CAP	2	3	BE	WROUGHT, SEAMLESS	B16.9	ASTM A403 GR WP316/316L-S	
CAP	3	24	BE	WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB – FBE LINED	2,102,165
BRANCH FITTINGS							
TEE	½	1 ½	SW	EQUAL, CL 3000, FORGED	B16.11	ASTM A182 GR F316/316L	
TEE	2	3	BE	EQUAL, WROUGHT, SEAMLESS	B16.9	ASTM A403 GR WP316/316L-S	
TEE	3	24	BE	EQUAL, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB – FBE LINED	2,102,165
TEE	¾	1 ½	SW	REDUCING, CL 3000, FORGED	B16.11	ASTM A182 GR F316/316L	
TEE	2	3	BE	REDUCING, WROUGHT, SEAMLESS	B16.9	ASTM A403 GR WP316/316L-S	
TEE	3	24	BE	REDUCING, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB – FBE LINED	2,102,165
WELDOLET	½	1	BE	FORGED, SCH AS PIPE	MSS SP-97	ASTM A182 GR F316/316L	
WELDOLET	3	8	BE	FORGED, SCH AS PIPE	MSS SP-97	ASTM A105N – FBE LINED	2,102,165
FLANGES							
SOCKET WELD	½	1 ½	RF	CL.150	B16.5	ASTM A182 GR F316/316L	
WELDNECK	2	3	RF	CL.150	B16.5	ASTM A182 GR F316/316L	
WELDNECK	3	24	FF	CL.150	B16.5	ASTM A105N – FBE LINED	2,102, 103,104,165
REDUCING FLANGE	½	3	RF	CL.150	B16.5	ASTM A182 GR F316/316L	

PIPING CLASS: AF1A0F-FA

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
FLANGES – CONT'D							
BLIND	½	3	RF	CL.150	B16.5	ASTM A182 GR F316/316L	
BLIND	3	24	FF	CL.150	B16.5	ASTM A105N – FBE LINED	102,103, 165
ORIFICE	2	2	RF	CL.300	B16.36	ASTM A182 GR F316/316L	
ORIFICE	3	24	FF	CL.300	B16.36	ASTM A105N – FBE LINED	2,54,102, 103,165
LINE BLINDS							
LINE BLIND	½	3	RF	CL.150, SPECTACLE BLIND	B16.48	ASTM A240 TP316	3
LINE BLIND	3	10	FF	CL.150, SPECTACLE BLIND	B16.48	ASTM A516 GR.70 – FBE LINED	3,102
LINE BLIND	12	24	FF	CL.150, SPADE & SPACER	B16.48	ASTM A516 GR.70 – FBE LINED	3,102
GASKETS							
GASKET	½	3	-	CL.150, SPIRAL WOUND, 4.5MM THK.	B16.20/ B16.5	SP. WINDING + INNER RING: SS316, FILLER: GRAPHITE, SS316 OUTER RING, LOW STRESS	70
GASKET	3	24	-	CL.150, NON-METALLIC FLAT FACE, 3.0MM THK	B16.21/ B16.5	NEOPRENE, SHORE-A, MIN. HARDNESS 60	
GASKET	3	24	-	CL.300, NON-METALLIC FLAT FACE, 3.0MM THK	B16.21/ B16.5	NEOPRENE, SHORE-A, MIN. HARDNESS 60	33
BOLTS							
STUD BOLT & NUTS	½	24	-	STUD BOLT C/W 2 HEAVY HEX. NUTS	B18.2.1/ B18.2.2	STUD: ASTM A193 GR. B7 ASTM A194 GR. 2H	15

PIPING CLASS: AF1A0F-FA

SECTION 5.0 - VALVES

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
VALVES(NOTE -81)							
CHECK	1	1 ½	SW	CL.800, SW TO B16.11, SPRING LOADED LIFT CHECK,BOLTED COVER	API 602 + ASME B16.34	BODY: ASTM A182-F316 TRIM: SS316+HF	12
CHECK	2	3	RF	CL.150, DUAL PLATE, WAFER TYPE, TO FIT BETWEEN B16.5 FLANGES	API 594	BODY: ASTM A351-CF8M TRIM: SS316+HF	
CHECK	3	24	FF	CL.150, DUAL PLATE, WAFER TYPE,TO FIT BETWEEN B16.5 FLANGES	API 594	BODY: ASTM B148-UNS C95800 TRIM: AL-BRONZE	
CHECK	2	3	RF	CL.150, SWING CHECK FLGD TO B16.5	API 6D	BODY: ASTM A351-CF8M TRIM: SS316+HF	
CHECK	3	24	FF	CL.150, SWING CHECK FLGD TO B16.5	API 6D	BODY: ASTM B148-UNS C95800 TRIM: AL-BRONZE	
GATE	½	1 ½	SW	CL.800, SW TO B16.11, SOLID WEDGE,STD PORT,OS&Y,BOLTED BONNET, HANDWHEEL	API 602 + ASME B16.34	BODY: ASTM A182-F316 TRIM: SS316+HF	12
GATE	2	3	RF	CL.150, FLGD TO B16.5, FLEXIBLE WEDGE, STD PORT, OS&Y, BOLTED BONNET, HANDWHEEL	API 600 + ASME B16.34	BODY: ASTM A351-CF8M TRIM: SS316+HF	
GATE	3	24	FF	CL.150,FLGD TO B16.5, FLEXIBLE WEDGE,STD PORT,OS&Y,BOLTED BONNET,HANDWHEEL / GEAR	API 600 + ASME B16.34	BODY: ASTM B148-UNS C95800 TRIM: AL-BRONZE	
GLOBE	½	1 ½	SW	CL.800,SW TO B16.11, SWIVEL PLUG DISC, OS&Y,BOLTED BONNET,HANDWHEEL	API 602 + ASME B16.34	BODY: ASTM A182-F316 TRIM: SS316+HF	12
GLOBE	2	3	RF	CL.150, FLGD TO B16.5, SWIVEL PLUG DISC, OS&Y, BOLTED BONNET, HANDWHEEL	API 623 + ASME B16.34	BODY: ASTM A351-CF8M TRIM: SS316+HF	12

PIPING CLASS: AF1A0F-FA

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
VALVES(NOTE -81) - CONT,D							
GLOBE	3	12	FF	CL.150, FLGD TO B16.5, SWIVEL PLUG DISC, OS&Y, BOLTED BONNET, HANDWHEEL / GEAR	API 623 + ASME B16.34	BODY: ASTM B148-UNS C95800 TRIM: AL-BRONZE	
BUTTERFLY	3	24	FF	CL.150, DOUBLE OFFSET, WAFER LUG TYPE TO FIT BETWEEN B16.5 FLANGES, GEAR	API 609, CAT.B	BODY: ASTM B148-UNS C95800 TRIM & SEAT: AL-BRONZE, PTFE	
BUTTERFLY	3	24	FF	CL.150, CONCENTRIC, LUG TYPE TO FIT BETWEEN B16.5 / B16.47-A FLANGES, LEVER / GEAR	API 609, CAT.A	BODY: ASTM A216 WCB LINED WITH CHLOROPRENE RUBBER OR EPDM TRIM : AL-BRONZE	165
BALL	½	1½	SW	CL.800, SW TO B16.11, FULL BORE, FLOATING BALL, LEVER	API 6D	BODY: ASTM A182-F316 TRIM: SS316 SEAT: RPTFE	12
BALL	2	3	RF	CL.150, FLGD TO B16.5, REDUCED BORE, FLOATING BALL, LEVER	API 6D	BODY: ASTM A351-CF8M TRIM: SS316 SEAT: RPTFE	12, 58
BALL	3	6	FF	CL.150,FLGD TO B16.5,REDUCED BORE,FLOATING BALL,LEVER / GEAR	API 6D	BODY: ASTM B148-UNS C95800 TRIM: AL-BRONZE SEAT: RPTFE	58
BALL	8	24	FF	CL.150,FLGD TO B16.5,REDUCED BORE,TRUNNION MOUNTED,GEAR	API 6D	BODY: ASTM B148-UNS C95800 TRIM: AL-BRONZE SEAT: RPTFE	58
BALL	2	3	RF	CL.150, FLGD TO B16.5, FULL BORE, FLOATING BALL, LEVER	API 6D	BODY: ASTM A351-CF8M TRIM: SS316 SEAT: RPTFE	12, 58, 71
BALL	3	4	FF	CL.150, FLGD TO B16.5, FULL BORE, FLOATING BALL, LEVER / GEAR	API 6D	BODY: ASTM B148-UNS C95800 TRIM: AL-BRONZE SEAT: RPTFE	58,71
BALL	6	24	FF	CL.150, FLGD TO B16.5, FULL BORE, TRUNNION MOUNTED, GEAR	API 6D	BODY: ASTM B148-UNS C95800 TRIM: AL-BRONZE SEAT: RPTFE	58,71